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Tensile Strength Increase by Cold Drawing

Development of a Law Covering the Tendency of Steel to Increase in Tensility—Variations and Breaking Points in Curves

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CHANGING relations of tensile strength have been noticed in cold drawing as drafting progresses either from the green or annealed rod, from the process annealed wire, or from the patented rod or wire. By green rod is meant the rod in the natural state, as it leaves the rod mill; the process annealed wire refers to that which has been annealed at about 1100 deg. Fahr. in order to relieve strains without attempting recrystallization; the patented wire rod or wire is in the normalized condition. The scope of this article is necessarily so restricted that it is not possible to consider the mechanical technology of wire drawing, as such.

Treating this subject from a practical standpoint, one is obliged to deal with wire rods of approximately 0.207 in. in diameter, that is, No. 5 American wire gage, since drawing from larger sections would not allow the high range of percentage of reduction that can be obtained normally without intermittent thermal treatment in drawing directly from a smaller rod or wire.

Like all natural laws, those governing the behavior of steel in cold drawing are inexorable, and our understanding of the results obtained depends primarily upon the determination of those laws. It is not claimed that the underlying laws of cold working are unknown, but it has been noted that, in literature pertaining to this subject, there is lacking a clear definition and interpretation of those laws.

The most admirable contributions to the subject of cold drawing are:

(1) Goerens, "The Influence of Cold Working on the Properties of Iron and Steel," Carnegie Scholarship Memoirs, 1911, Volume III.

(2) Percy Longmuir, "Some Aspects of Wire Drawing," Iron and Steel Institute, 1912, Volume LXXXVI.

(3) J. F. Tinsley, "How Heat Treating Affects Wire," American Iron and Steel Institute, 1914.

All investigators agree that the tensile strength is increased, while the maximum elongation and the contraction are reduced, by cold working. Goerens concludes by saying, "Summarized, it may be said concerning the mechanical properties that the tensile strength is increased by drawing in proportion as the deformation of the material is greater. The extent to which this may be carried depends on the composition of the material and on the size of the sections undergoing deformation. The tenacity developed by cold working of steel is hence dependent also on the following three factors:

"1. The capacity of the material for cold working.
"2. The chemical composition.
"3. The original dimensions."

Longmuir concludes, "In neither case does the increase in tensile strength possess an exact ratio to the amount of flow."

As is obvious, the amount of flow can be measured only by the change in the reduction of area, thus:

$$R = \frac{A_o - a}{A_o} \times 100$$

in which R = reduction in percentage from original area
A_o = area of original section in square inches
a = area in sq. in. of section to which wire or rod has been drawn.

Based on diameters, this formula reads:

$$R = \frac{D^2_o - d^2}{D^2_o} \times 100$$

in which R = reduction in percentage from original area
D_o = diameter of original section in inches
d = diameter in inches of section to which wire or rod has been drawn.

Data from J. F. Tinsley, as given in the following tables, represent three steels, a 0.10-per cent carbon, a 0.50-per cent carbon and a 0.70-per cent carbon steel, as noted in figures and tables.

As is apparent from the tables, the increase over the initial tensile strength of the rod in the foot lb. system is equal to the reduction in per cent, multiplied by 1000. This product, added to the initial tensile strength of the rod, gives the total tensile strength in lb. per sq. in., as recorded experimentally by the tensile test machine.

It is important to note that neither the heat treatment nor the initial size or shape of the section has any influence whatever, in cold drawing, on the rate of increase of tensility over the intial tensile strength before drawing. In other words, the original rod or wire may be either a green rod, or it may have been process annealed or patented, and of any shape or section, and still the same formula holds good. The effect of chemical composition will be considered later.

Therefore, the general formula for calculating the tensile strength of cold drawn wire can be expressed by the following:

$$T = \frac{A_o - a}{A_o} \times 100 \times 1000 + T_o$$

$$\text{or } T = \frac{D^2_o - d^2}{D^2_o} \times 100 \times 1000 + T_o$$

in which T = the tensile strength after cold drawing;

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Table I—0.10-Per Cent Carbon Steel (Tinsley)
(Tensile Strength in Lb. per Sq. In.)

No. of Draft as Given by Author	Gage,* In.	Initial Tensile Strength of Rod or Wire T_o	Actual Tensile Strength after Drawing T	Total Percentage of Reduction R	Increase over Initial Tensile Strength of Rod or Wire: Actual $(T - T_o)$	Increase over Initial Tensile Strength of Rod or Wire: Calculated $1000 \times \frac{A_o - a}{A_o} \times 100$	Total Tensile Strength of Wire Calculated $1000 \times \frac{A_o - a}{A_o} \times 100 + T_o$
	0.207	68,000	Green Rod				
1	0.151		113,000	47.0	45,000	47,000	115,000
3	0.088		150,000	82.0	82,000	82,000	150,000
	0.088	60,000	After first process annealing				
1	0.071		93,000	35.0	33,000	35,000	95,000
3	0.048		130,000	70.0	70,000	70,000	130,000
5	0.034		145,000	85.0	85,000	85,000	145,000
	0.034	62,000	After second process annealing				
1	0.030		82,000	21.0	20,000	21,000	83,000
3	0.021		124,000	62.0	62,000	62,000	124,000
5	0.015		143,000	80.0	81,000	80,000	142,000
7	0.012		151,000	88.5	89,000	88,500	150,500

*As Tinsley's figures give only the percentage of reduction, the gages have been computed.

A_o = area of original section in sq. in.;
a = area of section to which wire or rod has been drawn;
D_o = diameter of original section in inches;
d = diameter of section to which wire or rod has been drawn;
T_o = initial tensile strength before cold drawing.

However, this formula, which is parabolic in character, does not seem to hold good for the actual curve in its entirety. At a reduction of 90 per cent in a 0.10 per cent carbon steel, there appears to be a break in the curve, and so beyond this point the formula loses applicability in its present form.

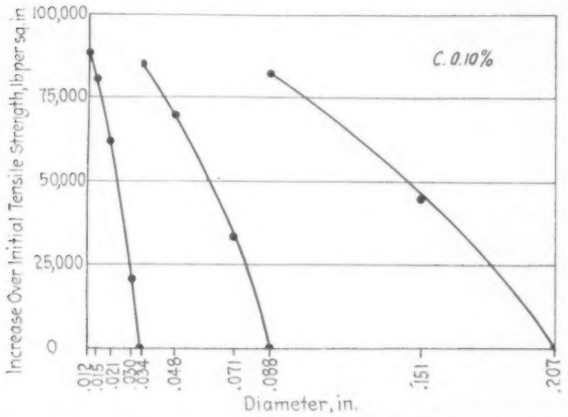


Fig. 1. Curves for Tinsley's 0.10 Per Cent Carbon Steel, with Intermittent Process Annealing. Refer to Table I

Note: In all these figures, on this and the succeeding pages, the dots represent experimental values; the lines show calculated values

By dissecting the actual values, beyond a reduction for which the formula holds good, it is noted that the values for the increase in tensile strength obtained by multiplying the percentage of reduction by 1000 are much too low. One also comes to the conclusion that the new curve, starting from the breaking point, is again parabolic, but steeper in slope than the previous curve. Further reduction of the wire by drafting shows that there are still more breaking points to be found in the curve.

For the sake of simplicity, let us call the breaking points in the curves, in order of their occurrence as the wire or rod is being drawn, B_1, B_2, B_3, etc., respectively. Using the areas of the wires at which these breaks occur as bases for the new parabolas, and using the total tensile strengths of these cold drawn wires as bases for T_n, the curves beyond these breaking points will follow the formulas given below.

However, these new increases in tensile strengths, that is, beyond the first breaking point, calculated by using the breaking points as bases, are in proportion to only one-half the percentages of reduction, thus:

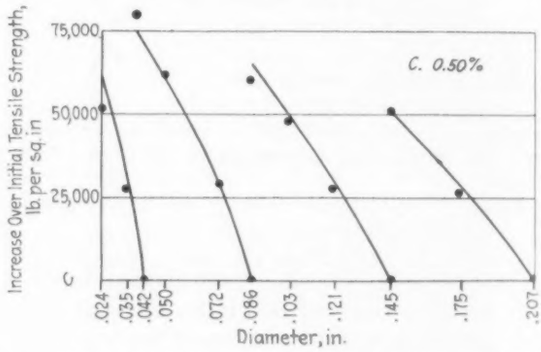


Fig. 2. Curves for Tinsley's 0.50 Per Cent Carbon Steel, with Intermittent Patenting. Refer to Table II

$$\frac{A_1 - a}{2A_1} \times 100, \text{ or } \frac{A_n - a}{2A_n} \times 100$$

$$T = \frac{A_1 - a}{2A_1} \times 100 \times 1000 + T_1$$

$$T = \frac{A_2 - a}{2A_2} \times 100 \times 1000 + T_2$$

or, generalized, $T = \frac{A_n - a}{2A_n} \times 100 \times 1000 + T_n$

in which T = tensile strength after cold drawing;

Table II—0.50-Per Cent Carbon Steel (Tinsley)
(Tensile Strength in Lb. per Sq. In.)

No. of Draft as Given by Author	Gage,* In.	Initial Tensile Strength of Rod or Wire T_o	Actual Tensile Strength After Drawing T	Total Percentage of Reduction R	Increase over Initial Tensile Strength of Rod or Wire: Actual $(T - T_o)$	Increase over Initial Tensile Strength of Rod or Wire: Calculated $1000 \times \frac{A_o - a}{A_o} \times 100$	Total Tensile Strength of Wire Calculated $1000 \times \frac{A_o - a}{A_o} \times 100 + T_o$
	0.207	95,000	Green Rod				
1	0.175		122,000	28.5	27,000	28,500	123,500
2	0.145		146,000	51.0	51,000	51,000	146,000
	0.145	115,000	After first patenting				
1	0.121		143,000	30.0	28,000	30,000	145,000
4	0.086		176,000	65.0	61,000	65,000	181,000
	0.086	128,000	After second patenting				
1	0.072		156,000	30.0	28,000	30,000	158,000
3	0.050		190,000	66.0	62,000	66,000	194,000
4	0.042		208,000	76.0	80,000	76,000	204,000
	0.042	156,000	After third patenting				
1	0.035		184,000	30.0	28,000	30,000	186,000
3	0.024		218,000	66.0	62,000	66,000	222,000

*As Tinsley's figures give only the percentage of reduction, the gages have been computed.

Table III—0.70-Per Cent Carbon Steel (Tinsley)
(Tensile Strength in Lb. per Sq. In.)

No. of Draft as Given by Author	Gage, In.	Initial Tensile Strength of Rod or Wire T_o	Actual Tensile Strength After Drawing T	Total Percentage of Reduction R	Increase over Initial Tensile Strength of Rod or Wire: Actual $(T - T_o)$	Increase over Initial Tensile Strength of Rod or Wire: Calculated $1000 \times \frac{A_o - a}{A_o} \times 100$	Total Tensile Strength of Wire Calculated $1000 \times \frac{A_o - a}{A_o} \times 100 + T_o$
	0.185	160,000	After patenting				
1	0.122		212,000	56.0	52,000	56,000	216,000

A_n = area in sq. in. of wire at which last break in the curve occurred;
a = area of section to which wire or rod has been drawn;
T_n = tensile strength of wire where last break in the curve occurred.

This halving seems to hold good for low and medium carbon steels, whereas in 0.70-per cent carbon and

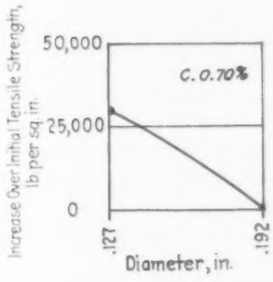


Fig. 3. Curve for Tinsley's 0.70 Per Cent Carbon Steel, after Patenting. Refer to Table III (Left)

Fig. 4. Longmuir's Tensile Curve from Rod Drawn Directly from 0.201 In. Diameter to 0.023 In. Refer to Table IV (Right)

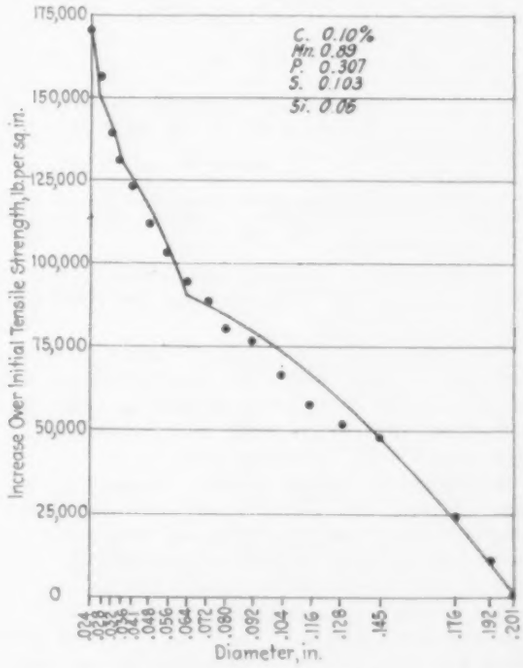
probably higher carbon steels (it cannot be said definitely, as no data are at hand) as shown in Table VII, the increase in tensile strength beyond the first breaking point in the curves is in proportion to the entire percentage of reduction, thus,

$$\frac{A_1 - a}{A_1} \times 100, \text{ or } \frac{A_n - a}{A_n} \times 100.$$

Below is a table giving actual and calculated data on a 0.10-per cent carbon steel taken from Longmuir. The figures are excellent for demonstrating three breaking points, the reduction having been carried to 0.024 in., a percentage of 98.6. The following gives the details of the drawing as carried out by Longmuir on the above steel.

Original rod diameter 0.201 in.
0.201-in. rod reduced in 0.001-in. drafts to 0.192 in.
0.192-in. rod reduced in 0.001-in. drafts to 0.176 in.
0.176-in. rod reduced in 0.001-in. drafts to 0.160 in.
0.160-in. rod reduced in 0.001-in. drafts to 0.145 in.

Rod drawn to 7-gage, then to 9-gage wire, and the following samples drawn from the 9-gage wire in 0.001-in. reduction per draft from 0.145 in. to 0.092 in.



Figures given for 0.145 in., 0.128 in., 0.116 in., 0.104 in. and 0.092 in. in our table.

Rod drawn to 5-gage, 7-gage, 9-gage, 11-gage and 13-gage, and then the following samples drawn from

Table IV—Longmuir's 0.10-Per Cent Carbon Steel
(Tensile Strength in Lb. per Sq. In.)

No. of Draft as Given by Author	Gage, In.	Initial Tensile Strength of Rod or Wire T_o	Actual Tensile Strength After Drawing T	Total Percentage of Reduction R	Increase over Initial Tensile Strength of Rod or Wire: Actual $(T - T_o)$	Increase over Initial Tensile Strength of Rod or Wire: Calculated $1000 \times \frac{A_o - a}{A_o} \times 100$	Total Tensile Strength of Wire Calculated $1000 \times \frac{A_o - a}{A_o} \times 100 + T_o$
	0.201	80,595	After annealing at 700°-720° C.				
9	0.192		91,302	8.75	10,707	8,750	89,345
25	0.176		104,877	23.3	24,282	23,300	103,895
56	0.145		128,083	47.9	47,448	47,900	128,495
19	0.128		132,160	59.5	51,565	59,500	139,095
31	0.116		139,171	66.8	58,576	66,800	147,395
43	0.104		147,034	73.4	66,439	73,400	153,995
55	0.092		159,040	79.0	78,445	79,000	159,595
17	0.080		160,966	84.2	80,371	84,200	164,795
25	0.072		169,411	87.2	88,816	87,200	167,795
32	0.064		174,989	90.0	94,394	90,000	170,595
		Total Tensile Strength Used as Basis in the Following Calculations			Actual	Calculated $1000 \times \frac{A_1 - a}{2A_1} \times 100$	Calculated $1000 \times \frac{A_1 - a}{2A_1} \times 100 + T_1$
		T_1	T		$(T - T_1)$		
	0.064	174,989					
24	0.056		183,680	23.4	8,691	11,700	186,689
15	0.048		192,640	43.8	17,651	21,900	196,889
32	0.041		203,750	59.0	28,761	29,500	204,489
11	0.036		211,680	68.4	36,691	34,200	209,189
		T_2	T		$(T - T_2)$	$1000 \times \frac{A_2 - a}{2A_2} \times 100$	$1000 \times \frac{A_2 - a}{2A_2} \times 100 + T_2$
	0.036	211,680					
15	0.032		219,520	20.8	7,840	10,400	222,080
10	0.028		237,440	39.5	25,760	19,750	231,430
		T_3	T		$(T - T_3)$	$1000 \times \frac{A_3 - a}{2A_3} \times 100$	$1000 \times \frac{A_3 - a}{2A_3} \times 100 + T_3$
	0.028	237,440					
16	0.024		250,880	26.5	13,440	13,250	250,690

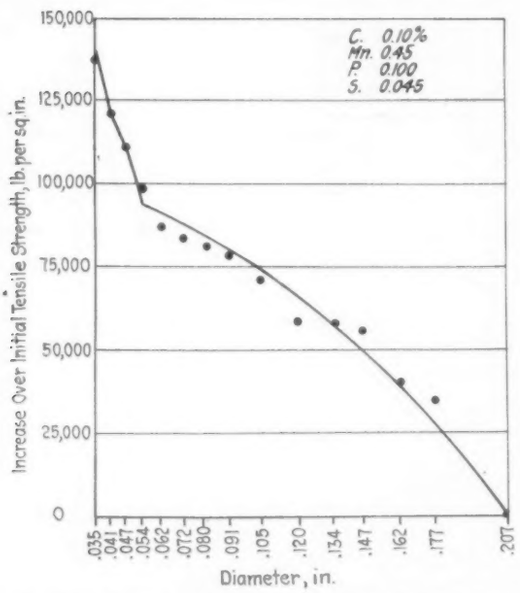


Fig. 5. Author's Tensile Curve from Rod Drawn Directly from 0.207 In. Diameter Down to 0.035 In. Diameter. Refer to Table V

the 13-gage wire in 0.001-in. reduction per draft from 0.092 in. to 0.072 in. Figures given for 0.080 in. and 0.072 in. in our table.

Rod drawn to 5-gage, 7-gage, 9-gage, 11-gage, 13-gage and 15-gage, and then the following samples drawn from the 15-gage wire in 0.001-in. reduction per draft from 0.072 in. to 0.056 in. Figures given for 0.064 in. and 0.056 in. in our table.

Rod drawn to 5-gage, 7-gage, 9-gage, 11-gage, 13-gage, 15-gage and 17-gage, and then the following samples drawn from the 17-gage wire in 0.001-in. reduction per draft from 0.056 in. to 0.041 in. Figures given in our table for 0.048 in. and 0.041 in.

Rod drawn to 7-gage, 11-gage, 13-gage, 15-gage, 17-gage and 18½-gage, and then the following samples drawn from the 18½-gage wire in 0.001 in. reduction per draft from 0.041 in. to 0.030 in. Figures given in our table for 0.036 in. and 0.032 in.

Rod drawn to 7-gage, 9-gage, 11-gage, 13-gage, 15-gage, 17-gage, 18½-gage and 20-gage, and then the following samples drawn from the 20-gage wire in 0.001 in. reduction per draft from 0.030 in. to 0.024 in. The figures given in our table are for 0.028 in. and 0.024 in.

Analysis of this steel is as follows: carbon, 0.10 per cent; manganese, 0.89 per cent; phosphorus, 0.307 per cent; sulphur, 0.103 per cent; silicon, 0.06 per cent.

Table V gives actual and calculated data on the cold drawing of a 0.10-per cent carbon steel. The figures are from an Eastern steel company. Analysis of the steel is: Carbon, 0.10 per cent; manganese, 0.45 per cent; phosphorus, 0.100 per cent; sulphur, 0.045 per cent.

Attention is called to the fact that, whereas in the previous case, as shown in Table IV, the wire was drawn to 0.024 in. and there are three breaking points, in this case the wire has been drawn to 0.035 in. and there are only two breaking points. If the wire had been drawn further, a third breaking point would have been encountered.

Table VI given in the following shows actual and calculated data taken from Longmuir's 0.50-per cent carbon steel. The cold drawing was executed by Longmuir in the following manner:

Original rod diameter, 0.214 in. Original rod reduced to 0.092 in. diameter, 0.001 in. reduction per draft. Figures given in our table for 0.192 in., 0.176 in., 0.160 in., 0.145 in., 0.128 in., 0.116 in., 0.104 in. and 0.092 in.

A 5-gage rod drawn to 7 gage, 9 gage, 11-gage and 13 gage. Then the following samples drawn from the 13-gage wire in 0.001-in. reduction per draft from 0.092 in. to 0.072 in. Figures given in our table for 0.080 in. and 0.072 in.

A 5-gage rod drawn to 7 gage, 9 gage, 11 gage, 13 gage and 15 gage. Then the following samples drawn from the 15-gage wire in 0.001 in. reduction per draft from 0.072 in. to 0.056 in. Figures given in our table for 0.064 in. and 0.056 in.

Analysis of this steel is carbon, 0.48 per cent; manganese, 0.87 per cent; phosphorus, 0.050 per cent; sulphur, 0.039 per cent; silicon, 0.058 per cent.

It has been previously stated that the tensile strength, as calculated by the formulas given in this paper, is not influenced in any way by the shape of the section which is being cold drawn. As proof of this, the following data from Longmuir on a 0.67-per cent carbon steel, drawn in rectangular rather than circular section, is cited:

Analysis of this steel is carbon, 0.67 per cent; manganese, 0.78 per cent; phosphorus, 0.032 per cent; sulphur, 0.027 per cent; silicon, 0.126 per cent.

As the first breaking point for this curve does not occur at a draft given by the author, it was necessary to calculate it. From the figures given by Longmuir the indication was that the breaking point lay at a point between a reduction of 63.7 per cent and that of 72.8 per cent. An interpolation for a reduction of 68

Table V—An Eastern Steel Company's 0.10-Per Cent Carbon Steel
(Tensile Strength in Lb. per Sq. In.)

No. of Draft as Given by Author	Gage, In.	Initial Tensile Strength of Rod or Wire T_o	Actual Tensile Strength After Drawing T	Total Percentage of Reduction R	Increase over Initial Tensile Strength of Rod or Wire: Actual $(T - T_o)$	Increase over Initial Tensile Strength of Rod or Wire: Calculated $1000 \times \frac{A_o - a}{A_o} \times 100$	Total Tensile Strength of Wire Calculated $1000 \times \frac{A_o - a}{A_o} \times 100 + T_o$
	0.207	65,000	Green Rod				
2	0.177		100,178	26.8	35,178	26,800	91,800
3	0.162		104,946	38.8	39,946	38,800	103,800
4	0.147		120,725	49.6	55,725	49,600	114,600
5	0.134		121,256	58.2	56,256	58,200	123,200
6	0.120		122,006	66.4	57,006	66,400	131,400
7	0.105		136,856	74.2	71,856	74,200	139,200
8	0.091		143,747	80.7	78,747	80,700	145,700
9	0.080		146,221	85.2	81,221	85,200	150,200
10	0.072		148,594	87.8	83,594	87,800	152,800
11	0.062		152,361	90.2	87,361	90,200	155,200
12	0.054		163,740	93.2	98,740	93,200	158,200
		Total Tensile Strength Used as Basis in the Following Calculations T_1	T		Actual $(T - T_1)$	Calculated $1000 \times \frac{A_1 - a}{2A_1} \times 100$	Calculated $1000 \times \frac{A_1 - a}{2A_1} \times 100 + T_1$
	0.054	163,740					
13	0.047		175,802	24.2	12,062	12,150	175,890
14	0.041		185,563	42.3	21,823	21,150	184,890
		T_2	T		$(T - T_2)$	$1000 \times \frac{A_2 - a}{2A_2} \times 100$	$1000 \times \frac{A_2 - a}{2A_2} \times 100 + T_2$
	0.041	185,563					
15	0.035		202,679	27.1	17,116	13,550	199,113

Table VI—Longmuir's 0.50-Per Cent Carbon Steel
(Tensile Strength in Lb. per Sq. In.)

No. of Draft as Given by Author	Gage, In.	Initial Tensile Strength of Rod or Wire T_o	Actual Tensile Strength After Drawing T	Total Percentage of Reduction R	Increase over Initial Tensile Strength of Rod or Wire: Actual $(T - T_o)$	Increase over Initial Tensile Strength of Rod or Wire: Calculated $1000 \times \frac{A_o - a}{A_o} \times 100$	Total Tensile Strength of Wire Calculated $1000 \times \frac{A_o - a}{A_o} \times 100 + T_o$
	0.214	97,395	After annealing at 700°-720° C.				
22	0.192		114,240	19.5	16,845	19,500	116,900
38	0.176		125,440	32.3	28,045	32,300	129,695
54	0.160		140,806	44.3	43,411	44,300	141,695
69	0.145		145,600	54.1	48,205	54,100	151,495
86	0.128		165,760	64.2	68,365	64,200	161,595
98	0.116		165,760	70.7	68,365	70,700	168,095
110	0.104		170,240	76.4	72,845	76,400	173,795
122	0.092		185,920	81.6	88,525	81,600	178,995
		Total Tensile Strength Used as Basis in the Following Calculations T_1	T		Actual $(T - T_1)$	Calculated $1000 \times \frac{A_1 - a}{2A_1} \times 100$	Calculated $1000 \times \frac{A_1 - a}{2A_1} \times 100 + T_1$
	0.092	185,920					
16	0.080		192,640	24.4	6,720	12,200	198,120
24	0.072		201,600	38.7	15,680	19,350	205,270
13	0.064		206,080	51.7	20,160	25,850	211,770
21	0.056		224,000	63.0	38,080	31,500	217,420

per cent was made, and this taken as a basis for the first breaking point.

It will be noted that, despite the diversified drawing practices of the different investigators whose data were

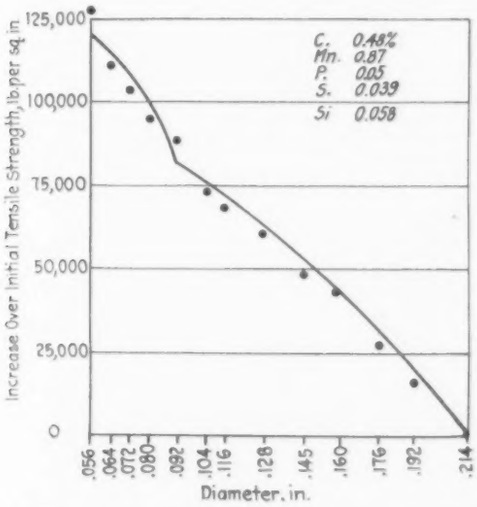


Fig. 6. Longmuir's Tensile Curve from Rod Drawn Directly from 0.214 In. Diameter to 0.056 In. Refer to Table VI
(Left)

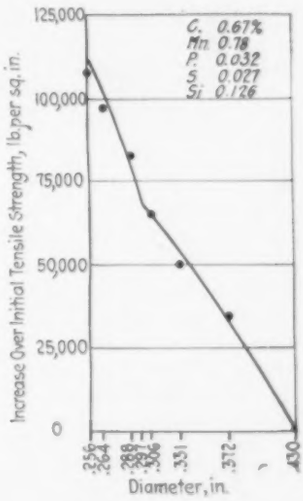


Fig. 7. Longmuir's Curve for 0.67 Per Cent Carbon Steel, Cold Drawn in Rectangular Section. Refer to Table VII
(Right)

taken for analysis, and regardless of the difficulty of obtaining accurate results on account of irregularity of section, non-uniform cooling of coil, different finishing temperatures, probable acid brittleness, etc., the tendency of the increase of tensile strength as expounded in this article has been shown to follow a definite law.

In regard to chemistry, the carbon content influences the increase in tensile strength, as drawing progresses, only indirectly. It appears that, the higher the carbon content, the earlier the breaking point in the curve will first occur, thus for a 0.10-per cent carbon steel the first breaking point seems to take place for a reduction of 90 per cent; in a 0.50-per cent carbon steel, at a reduction of about 80 per cent; and for a 0.70-per cent carbon steel, at about 70 per cent reduction.

Also, it is to be noted that, from the initial rod to the first breaking point in the curve, carbon has no influence whatever on the rate of increase of tensile strength, whereas beyond the first breaking point, in low and medium carbon steels, the increase is proportional to one-half the reduction from the breaking point used as a base, and in high carbon steels proportional to the entire reduction.

In concluding the author hopes that the question treated may arouse interest so that more light will be thrown on this particular problem.

Table VII—Longmuir's 0.67-Per Cent Carbon Steel
(Tensile Strength in Lb. per Sq. In.)

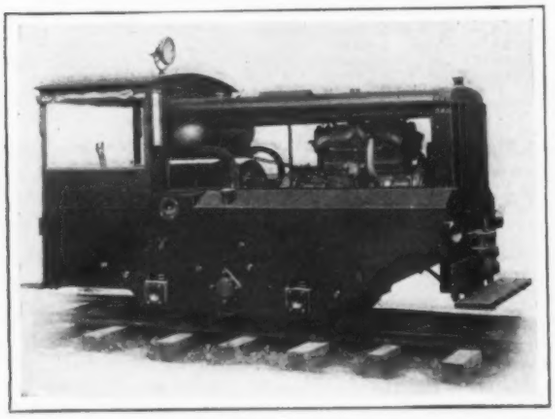
Gage of Wire Before Drawing, Inches: Thickness	Width	Initial Tensile Strength of Rod or Wire T_o	Actual Tensile Strength After Drawing T	Total Percentage of Reduction R	Increase over Initial Tensile Strength of Rod or Wire: Actual $(T - T_o)$	Increase over Initial Tensile Strength of Rod or Wire: Calculated $1000 \times \frac{A_o - a}{A_o} \times 100$	Total Tensile Strength of Wire Calculated $1000 \times \frac{A_o - a}{A_o} \times 100 + T_o$
0.228	0.365	109,760	After patenting				
0.171	0.330		144,256	32.2	34,496	32,200	141,960
0.128	0.305		159,760	53.0	50,000	53,000	162,760
0.105	0.288		174,720	61.7	64,960	61,700	170,460
0.026631 sq. in.*				68.0*		*68,000	*177,760
		Total Tensile Strength Used as Basis in the Following Calculations T_1	T		Actual $(T - T_1)$	Calculated $1000 \times \frac{A_1 - a}{A_1} \times 100$	Calculated $1000 \times \frac{A_1 - a}{A_1} \times 100 + T_1$
0.026631 sq. in.*		177,760*					
0.056	0.275		190,803	11.2	13,043	11,200	188,960
0.068	0.255		206,618	34.9	28,858	34,900	212,660
0.060	0.249		219,900	43.8	42,140	43,800	221,560

*It was necessary to calculate this item, as drafts taken by Longmuir were too far apart to determine the first breaking point.

New Gasoline Locomotive

The Industrial Equipment Co., formerly the Cummings Machine Co., Minster, Ohio, has placed on the market the new model gasoline locomotive, shown in the accompanying illustration. It is known as the Minster, Model F, and is made in 6 and 7-ton sizes, and is said to embody several new features.

A Buda engine is used and also Westinghouse starting and lighting equipment, Stromberg carbureter, Duplex governor, Splitdorf aero-model magneto with inclosed impulse automatic starter, Hyatt roller bearings, New Departure ball bearings, Willard storage battery and Diamond roller chain. There has been no change in the method of transmitting power from the engine to the wheels, the new model having the



Engine and Drive Disk Assembly Are Combined in One Unit

friction and chain drive used heretofore. The frame is of all-steel box-girder construction, and the axles, jack shaft and friction disk shaft of special high-manganese chrome-alloy steel. Carnegie rolled steel wheels are used.

The engine and drive disk assembly are combined in one complete unit with a two-point suspension, an arrangement intended to assure maximum transmission of power and proper alignment of all working parts. By changing the method of braking a number of parts have been eliminated, it is claimed; when the brake is applied two heavy iron shoes, placed diametrically opposite, grip a steel brake wheel on the jack shaft. This method, it is claimed, is 100 per cent efficient, and with a pressure of about 25 lb. the wheels can be locked. A special feature is claimed in the stationary hand-wheel method of shifting the fiber wheel across the face of the disk to get forward, reverse or change of speeds.

A primer, attached to the engine manifold, is manually operated from the cab, a feature that facilitates starting. For signaling a Fulton exhaust whistle is incorporated. The cab is said to be large, and to contain all control levers conveniently located.

Foreign Loans and American Industries

The National Foreign Trade Council has sent a letter to other trade organizations and chambers of commerce throughout the country requesting their cooperation in a plan which it believes will assist in reducing unemployment in the United States by providing that part at least of the proceeds of foreign loans floated here shall be spent for American products.

The council urges American investors to insist that the underwriters of foreign loans shall require the inclusion in the loan agreement, wherever practicable, of a stipulation covering such use of the loan proceeds. The council points out that it is the settled practice of British and other European bankers to require such a stipulation as a condition precedent to making a foreign loan, and adds that the effect of such a practice in providing employment for the industries of the country furnishing the money is obvious.

The National Foreign Trade Council includes in its membership the United States Steel Corporation, Standard Oil Co., Pullman Co., Consolidated Steel Corporation, Westinghouse Electric Co., Hupp Motor Car Co., International Harvester Co., American Locomotive Co., General Electric Co., Foundation Co., and American Radiator Co.

Detroit Companies Merged

The Ewing Bolt & Screw Co. has acquired the plant of the Detroit Machine Co., and new capital is being provided for the development of both concerns.

The Detroit Machine Co., located in the east end, on Hillger Avenue, builds machinery, dies, tools, and does general production work, but plans contemplate the sale of the property and the construction of a new plant in the River Rouge, near the Ford steel plant, on property owned by the Ewing Corporation.

The Ewing Bolt & Screw Co. has been in operation less than a year, and manufactures wood screws, bolts and rivets. Myles E. Ewing, president, and J. A. Hale, secretary-treasurer of the company, are now also president and secretary-treasurer, respectively, of the Detroit Machine Co.

David W. Pell, manager of the Detroit Machine Co., has been made production manager at the Ewing Bolt & Screw Co. plant.

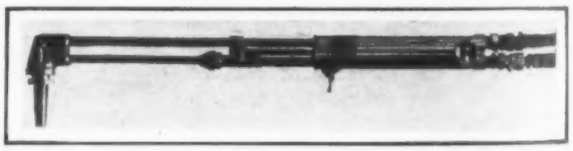
The directors are Hal. H. Smith, Frank W. Blair, Arthur T. Waterfall, David W. Pell, A. N. Marion, Myles E. Ewing, J. A. Hale, Detroit; and H. J. Douglas and David L. Rockwell, of Cleveland, the latter being vice-president.

New Cutting Torch

The cutting torch shown in the accompanying illustration is a new design recently brought out by the Davis-Bournonville Co., Jersey City, N. J.

It differs from the company's standard torch in that two tubes instead of three connect the head with the handle, the preheating gases, oxygen and acetylene or other combustible gases being mixed in a chamber between the handle and the head. This change involves a new form of tip, inasmuch as mixing of the preheating gases takes place before the gases reach the tip.

The tubes are silver soldered in the head, which is a copper forging. The ratio of mixed gases is controlled by two needle valves, one having a crossbar handle and the other a knurled disk handle. The cutting oxygen valve is operated by a finger lever connected to a linkage designed so as to hold it in either



Two Tubes, Instead of Three, Connect Head with Handle

the closed or open position. The operator may continue cutting without holding his finger on the trigger, the linkage serving to hold the valve open until such time as he wishes to stop the cut, when reverse pressure on the trigger closes the valve. The pressure of the spring holds it closed until the trigger is again pulled to the open position.

The weight is less than that of the previous model. Provision is made for easily removing the back end in case it becomes necessary to clean the screen or to renew the oxygen cutting valve seat. The tips are of copper and are held in a taper seat by a bushing nut. They are made with the cutting oxygen hole in the center and the preheating holes around it, the number of preheating holes varying from two to six depending on the gas used and the manner in which the torch is applied, also the metal to be cut.

The new torch is said to have superior characteristics for cutting wrought iron, steel and cast iron and the distribution of mixed gases to the tip to assure that all preheating flames are uniform in balance. Gases of low calorific value such as butane, hydrogen, carbo-hydrogen and even illuminating gas, are said to be used efficiently although acetylene is recommended.

Design of a Modern Automobile Plant

Providing the Power, Heating, Water Supply and Other Services for a 10,000-Employee Development—The Industrial Institution of the Future

BY PAUL L. BATTEY*

THE location of the power plant was difficult owing to the restricted area of the site and the necessity for non-interference with manufacturing space and routing. It is located practically in the center of the circle of product routing and does not in the least interfere with it. It is also an integral part of the main building structure practically the same superstructure steel work being used as for the remainder of the manufacturing section.

A reinforced concrete coal storage bin is located immediately adjacent and occupies the major portion of the light court between the manufacturing shop section and the stock building. Coal is received on a spur of one of the incoming tracks serving the stock building and concrete depressed track hopper for unloading is located adjacent to the boiler room and under the

The Testing Plant at the End of the Assembly Building Has a Steel Structure Designed for Ready Superposition of Additional Stories

electric overhead traveling bucket crane covering the storage bin and the elevated coal bunker over the stokers. The craneway extends out beyond the building thus to cover also a second track from which coal in emergencies can be unloaded directly from cars by the bucket crane. The receiving hopper has a capacity of four cars. The outside storage bin has a capacity for 7500 tons of coal. The overhead bunker has capacity for 400 tons and from this coal is discharged by gravity direct to the stoker hoppers by means of motor driven weighing larry.

An analysis of the coal supply available in the district led to the selection of buckwheat anthracite of about 11,500 B.t.u. calorific value per pound, burned on chain grate stokers with forced draft. The design of flat arch and combustion chambers gives absolutely smokeless combustion.

The boiler plant equipment adopted consists of six water tube boilers of the four drum type, each with a capacity of 200 per cent normal rating of a little over 1200 hp., although maximum economy in operation is obtained at about 1000 hp. The boilers are placed in batteries of two in thoroughly insulated settings. The operating steam pressure is 175 lb., and superheaters for 100 deg. are installed. Boiler room auxiliaries are turbine driven. All coal is weighed and water measured into boilers and daily evaporation record kept. A complete combustion indication and control equipment is provided.

Ashes are removed from the hoppers under stokers by means of a steam jet conveyor, which discharges into a concrete bin located just outside boiler room over track, so that ashes can be loaded by gravity chutes into railroad cars or auto trucks. The bin has capacity for four to five days' run and hoppers under grates for full day's run, so that removal may take place at off peak periods. This type of conveyor was chosen for its simplicity, and cleanliness, with particular reference to painting and varnishing. The chimney is of reinforced concrete, and the boiler breeching is of ⅜-in. asbestos lumber within a steel framework and lined with 1 in. fire felt pointed up with high temperature cement.

In the turbine room are provided two 2500 and one 3750 kva. generators with suitable turbine and electro-driven exciter units and two 2500 cu. ft. compound two-stage air compressors. In addition to these main units full equipment of turbine driven auxiliary apparatus is provided. The power plant has an equivalent capacity of 8000 kw., including the two air compressor units.

The turbines driving generators are of the mixed pressure bleeder type arranged to utilize all excess exhaust steam throughout the year in connection with the air compressors, heating system and steam requirements for various drying rooms and kilns. Condensers and cooling tower are provided for summer months, the cooling tower, of the forced draft type, being located on the roof of the power house. The power house is immediately adjacent to the dry kilns, the heating units and fans for which are located in a basement room below the kilns connecting with the basement of the power house, so that they are entirely taken care of by the power house operators, besides making possible a short steam connection.

It will further be noted that the power house is very close to the wood shop, from which provision is made to remove all refuse by exhaust line to a separator on the power house roof, from which it leads to storage hopper and chute to two boilers fitted for burning wood refuse. A wood hog prepares all refuse as it leaves the shop.

The water supply developed into somewhat of a problem as the public supply was inadequate. Four 8-in. wells 600 ft. deep were driven on property of the company, the capacity of each being approximately 200 gal. per min., using Weber air lifts with solenoid operated air supply valves arranged for remote control at the power house switchboard. The discharge line from

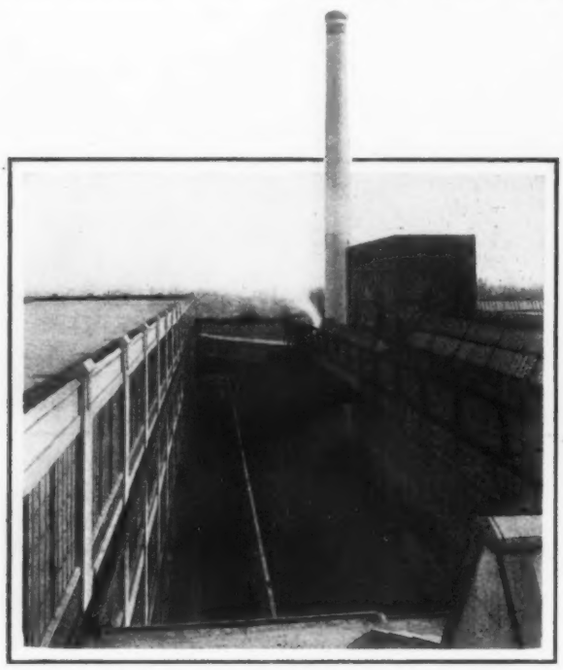
*Consulting engineer, 123 West Madison Street, Chicago. For the past 2½ years consulting engineer for the Willys Corporation, the Willys Overland Co. and allied interests and formerly vice-president of the Arnold Co., Chicago.

Article is concluded from page 656, issue of March 9.

From the Testing Floor the Completed Automobiles Go into the Storage Building and Thence on a Covered Ramp Spanning the Incoming and Outgoing Railroad Tracks Reach the Car Loading Docks

the wells leads to the 750,000 gal. low level reservoir immediately adjacent to the power house. These wells also supply the drinking fountains by means of centrifugal pump circulation.

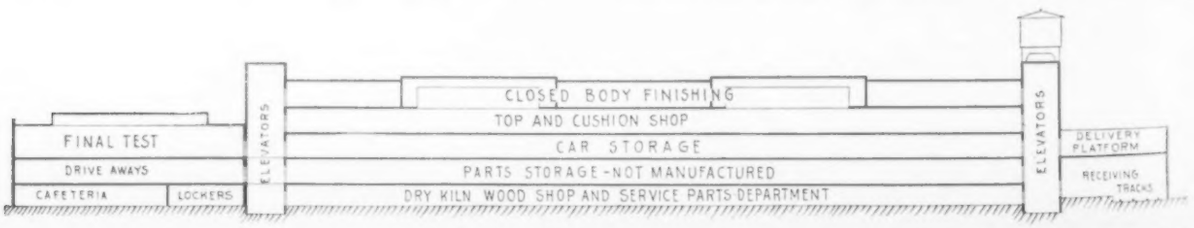
The large storage reservoir was provided because of the insistence of the insurance companies upon another source of water supply additional to the city mains and the elevated storage tanks connected to the sprinkler system and fire lines. The required reservoir capacity was 500,000 gallons, and as it involved considerable investment, effort was made to turn it to as many other uses as possible. In addition to the city water line connection and the discharge from the deep wells, a large portion of the rainwater from the roof is piped to the reservoir through a sedimentation compartment, as an analysis demonstrated that the piping of this water to the reservoir would cost no more than the usual down spout and sewer connections. Further, this reservoir, through the excess 250,000 gal. over the fire storage requirement, is utilized as an integral part of the condensing system for the power generating units and water supply to the boilers. Pumping is done in off peak periods, thus increasing the use factor of both the reservoir and the power plant. City water, containing a considerable amount of the incrustible solids, is not used except in emergency. A mixture of the water from the deep wells, which contains only a nominal amount of scale forming solids, and the rain water from the roof makes an excellent boiler water. An analysis of the rainfull records over a period of years indicates that the plant will be provided with an ample supply, using the well water and roof water together.



In the Light Court Between the Manufacturing Shops and the Stock Building Is a Reinforced Concrete Coal Storage Bin of 7500 Tons Capacity

The decision upon the 750,000 gal. capacity for the reservoir was based upon a careful analysis of all factors of water supply and cost. To have saved all of the roof water would have involved an additional investment for reservoir capacity, the fixed charges upon which were in excess of the cost of otherwise providing the water. The reservoir is an integral part of the building construction, as it is simply the north basement under the 40 ft. shop bay walled off from the rest of the space and waterproofed during construction. This basement was of less importance in its location as factory storage space than the rest of the space on this level, and therefore meant little or no sacrifice in using it for the reservoir.

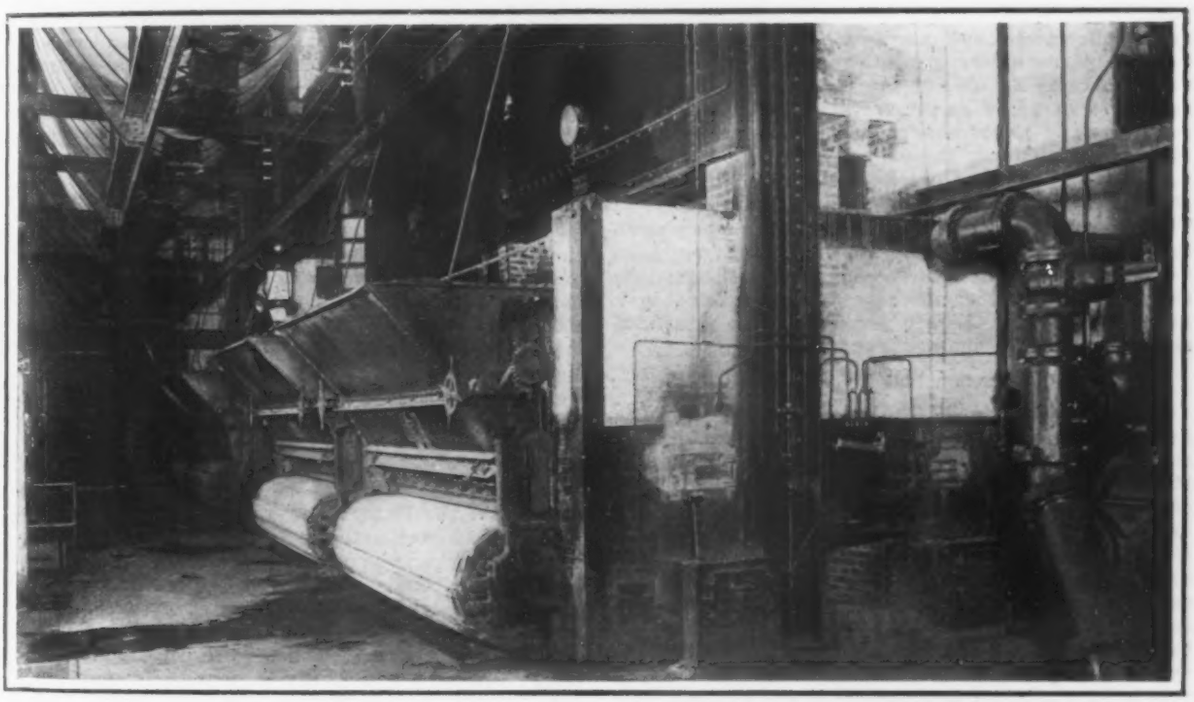
The plumbing and sewer lines were worked out to provide for modification of the departmental relationship which would probably change the number of employees in these departments. All of the toilet rooms are designed as multiple units exactly alike throughout the entire plant. Waste lines below ground provide for the maximum grouping estimated. All the toilet room compartments and doors are of steel baked enameled and are interchangeable. The doors are fitted with a gravity type of hinge. There are one to four wash bowls in each toilet room, all with uniform arrangement, but the main wash rooms, of which there are two at the extreme northwest and southwest corners of the plant, have each a capacity for approximately 3000 men. The wash sinks in both rooms being uniformly arranged in multiple unit grouping, each pair of sinks for ten men.



The Car Storage Floor of the Storage Building Is Reached Directly at One End from the Testing Room, and at the Other End at This Level Is the Platform Connecting with the Ramp to the Shipping Docks

Close to each wash unit is located a group of lockers so that every employee has a locker immediately adjacent and practically an equal distance from his wash sink. Each of these wash rooms is provided with local hot water heating tanks.

The plant is heated throughout, with the exception of the shipping docks, with exhaust steam. The motor shop, assembly, test and stock buildings are heated by direct wall radiation, and the new manufacturing bays are heated with indirect Sirocco fan units located on the several balconies along the center line of the shop. The fan units provide for air circulation in the summer months. Steel plate and other stock carried in the basements under the 40 ft. bays is highly susceptible to corrosion on account of the salt atmosphere. The basements are used as return air ducts, the crane hatchway at each end of the 60 ft. crane aisles serving as inlets to the basement for recirculation of a large portion of the air in the shop and the intake of the fan unit connecting by duct to the basement at the center of the bay. The fan units have connection to the roof from which inlet the proper amount of fresh air is introduced into the shop. The distribution of warm air from the fans is accomplished by means of flat ducts



From the 400-Ton Overhead Bunker in the Boiler Room the Coal Is Discharged to the Stoker Hoppers Through a Weighing Larry. The larry may be seen in the background

located immediately under the overhanging balcony platforms, the concrete floor on top and the supporting floor beams forming three sides of the duct, it being simply necessary to close the bottom with properly ribbed sheet steel with adjustable outlets located on 20 ft. centers throughout the shop. This location for the distribution ducts makes the usual clumsy blast fan duct system happily absent and puts the distribution ducts in the best possible position from a heating and circulating standpoint, and further entirely eliminates any interference with the installation of shaft hanger supports under the balcony structures. The entire piping system for exhaust steam distribution for heating was welded on the job and is a most excellent example of the economy and character of work resulting from this improved method of making up piping. Bends are used wherever possible with resulting flexibility.

The receiving and storage of fuel oil, lubricating oils, paints, varnish and other miscellaneous inflammable materials is taken care of in a specially constructed reinforced concrete vault 32 x 240 ft. located beneath the east shipping dock at the extreme north end where means for gravity unloading from tank cars and trucks is provided. Duplicate 50,000 gal. concrete fuel oil tanks are provided, together with a full complement of steel tanks of various sizes for the storage of other materials.

A complete system of pumps and pipe line distribution is installed supplying with fuel oil the heat treatment furnaces and the heater units for the enameling ovens, together with a number of other miscellaneous furnaces for the manufacturing department. Local oil heating equipments throughout the plant are duplicated as far as possible and furnaces are of regenerative type.

An item which may be of interest is a new type of heating equipment installed in connection with the enameling ovens. Each of the ovens is provided with a "Merrill process" unit, consisting of heat absorber, of Foster superheater elements, circulation pumps, and welded pipe radiation sections in the ovens, of the locomotive superheater type, valves, connecting pipes and expansion tank. This system is essentially the same as an ordinary hot water heating system with high flash point oil used for the circulating medium, the ovens carrying a temperature of 450 deg. The heating units are located immediately under the ovens in each case in tile walled compartments. Complete automatic control equipment is provided of both temperature and pressure types so that the regulation in the ovens is expected to be fully equal to those of the electrically operated type.

Owing to the situation with regard to the supply of electric power and because of the unusually favorable location with regard to fuel oil supply, it was decided that the direct heating method adopted would show a large saving as compared with electric heating and at the same time provide equally as good regulation and cleanliness, these being the principal advantages of the electric ovens. Two ovens have been equipped with an oil heated closed circuit, direct radiation hot air system, which promises good results.

All necessary locations in the plant are supplied by piping systems for gasolene and kerosene, with substations for distribution of lubricating oils, cutting compounds, etc. Tanks for the storage of gasoline are below ground adjacent to the oil room and arranged to be filled by gravity from tank cars or trucks, a water displacement system being used for tanks and distribution.

A complete bell automatic telephone plant of 200 stations is located in the center of distribution with ample outside trunk line connections. Extensive sys-

tems for watchmen's clock, fire-alarm and auto-call is provided.

The best possible floor is provided where men stand at work in all manufacturing space.

Creosoted blocks known to the trade as Kreolite are used throughout the plant. So far as is known, this installation contains the largest area of wood block floor in any industrial plant. This type of floor is considered as near ideal as is possible to provide from the standpoint of permanence and satisfactory trucking.

The entire plant is co-ordinated on 20 ft. centers, the bays being numbered from the northwest corner south and from the same corner along the north of the corresponding bays are lettered. Floor levels are identified by suffixed numbers so that it is possible to describe any spot 20 ft. square, in the plant by one or two figures, a letter and suffix figure.

In construction the multiple unit idea was developed along many lines because of its reduction in cost and expedition of work. The original make-up of forms was used through the entire work and upon completion of many of the sections were sold for a unit built garage with an accompanying erection plan* thus realizing three times the usual salvage value. Some 800 oak trees upon the site were removed and by a small temporary sawmill cut into railroad ties for the track work and smaller pieces cut into foot blocks for shop containers. Some of the quantities involved in the construction carry an idea of the size of the plant, such as 70,0000 cu. yd. of earth excavation, 75,000 cu. yd. of concrete work, 10,000 tons of steel, both reinforced and structural, 350,000 sq. ft. or about 8 acres of steel sash windows, 30 acres of wood block floors, 7000 horse power electric motors and 1½ miles of railroad track. The maximum force of construction men employed on the work was approximately 2000 and had it not been for the delay due to general business conditions, the entire work would easily have been completed in a little over a year. Eighty per cent of the structural steel is represented in six different pieces.

Expansion and the Future

It was decided in the beginning to make provision for only approximately 25 per cent future additional space, which could be obtained by three additional stories on the test building, and the rebuilding of the old mill constructed motor shop, by extension of the unit construction embodied in the new plant, if at some later time developments in the construction of automobiles should involve the necessity for providing this additional space. The possibility of any material enlargement of the plant was definitely disposed of with the conception of limiting the number of employees to approximately 10,000 men, as it was thought undesirable to have a larger aggregation in one location. One of the principal reasons for the choosing of the Newark district for the location of this plant was its distance from the vortex of automobile production and its diversity of manufacturing which from many economic aspects is highly advantageous as compared to the extremely specialized centers.

This plant within itself is, however, an example of extreme concentration and while embodying many useful and effective conditions, from the standpoint of production and supervision, it is the writer's firm belief that generally with the future will come further decentralization and reduction in size of plant units for economic reasons involving the human element rather than the physical equipment. Too little consideration is given to environment of men employed in factories and our present labor situation is largely the result of concentration of industry in large units where the human relationship is entirely lost in the magnitude of organization. Henry Ford's pioneering in the division of his factories into comparatively small units sufficiently removed from each other, properly co-ordinated, (and here the wireless telephone and aeroplane may be useful) should bring back the old-fashioned harmonious relationship between the "old man" in charge, who knows by name all "the boys" who are getting out the work. Mr. Ford having previously pioneered in the development of quantity production, is quite the logical one to take the lead in the decentralization of the industry. There is one factor in connection with this movement, however, which should receive consideration, and that is the inherent tendency for the pendulum to swing from one extreme to the other and where a happy compromise is again the best answer.

Industry in general and, in fact, our entire civilization, seems to be entering upon a new era which will bring within a comparatively few years widespread changes. The entire development centers around increased facilities for the production and distribution of electrical energy. Our railroad facilities have frequently been called the arteries of the nation, but now comes a complete new nerve system through which the control and distribution of industry, of transportation and commerce will be affected. With the realization of a complete network of electric power distribution, inter-connecting power production plants of large capacity and economic location as to hydraulic and fuel energy supply, complete electrification of trunk line railroads will quickly follow and this, together with the general establishment of permanent roadways throughout the country, with the broad adoption of automotive equipment for short haul traffic, will bring about further decentralization of industry and population. Workers will again begin to live normal open air lives in homes and factories, as under the new conditions practically every comfort and advantage of city life would be available, in what are now considered isolated locations. In other words, the logical evolution of co-ordinated power supply, transportation and industry will bring us back to the conditions of previous generations in home life and happy, useful employment, where all can feel personal interest in work and the spirit of craftsmanship be reborn.

There is a further phase of unified power distribution which will materially affect industry and that is the use of coal for other than power production purposes. With electrification, 25 to 30 per cent increased capacity of the railroads would be available for commercial purposes by the freeing of rolling stock and trackage from the handling of their own fuel supply. Factories, offices, homes and public buildings will, however, have to be supplied with heat in our climate and until this can be done electrically, due to betterment of diversity and load factors of power system, coal or oil will probably have to be used.

Electric heating has the inherent disadvantage, roughly, of the 10 to 1 conversion ratio and cannot be generally adopted until we begin to design our factories, buildings and homes along the line of greater heat conservation, similar to what is being realized in the present industrial electrically heated ovens and insulated domestic cooking ranges, with not inconceivably, regenerative heating systems. Such construction practically adapted would insure cool and comfortable buildings in summer months and above all, conserve our diminishing coal supply. It would greatly relieve congestion of transportation from unnecessary fuel movements, and cleanse the atmosphere of partially consumed products of combustion.

General development along these lines is undoubtedly a matter of many years owing to present investments, but it is not a thing that would under ordinary circumstances be accomplished by broad, simultaneous application. It is entirely conceivable that in the near future, with these general possibilities before us, entirely new methods of building construction, with the idea of heat conservation, will be developed, and who couldn't be happy in a factory (where many men spend the larger proportion of their daylight hours) when supplied with an abundance of sunlight, pure air and cheerful physical and social environments, whether he be manager or worker; and happiness is the goal of civilization and the foundation of permanent nations?

Those interested in the scientific congress which is to be held by the Association of Engineers graduated from the technical school of Liege can obtain a detailed list of the questions to be discussed by addressing a request to the secretary-general of the association at 16, Quai des Etats-Unis, Liege, Belgium. The technical meetings are scheduled for June 11 to 16 inclusive and simultaneous with these will be conducted an exhibition, which will extend to July 14.

Design of Open-Hearth Furnaces

Regenerator Computations for the Volume and Weight of Checkerwork Required—Temperature Changes Based on Time of Reversals

BY A. D. WILLIAMS*

IN THE IRON AGE of Feb. 12, 1920, page 475, several rules were given for arriving at the amount of checkerwork required. According to Gruner, from 50 to 70 lb. of checker brick were required per pound of coal burned per reversal. In the case considered 188 cu. ft. of gas was used per second, each pound of coal producing 70 cu. ft. of gas. The coal consumption, therefore, is 2,686 lb. per second. The weight of checker brick for this amount of coal would be from 60 lb. to 85 lb. According to this rule, the amount of checker brick would be:

	50 to 1	70 to 1
For 15 min. (900 sec.) reversals..	120,220 lb.	168,320 lb.
	54,540 kg.	76,360 kg.
20 min. (1200 sec.) reversals..	160,300 lb.	224,430 lb.
	72,720 kg.	101,810 kg.
25 min. (1500 sec.) reversals..	200,410 lb.	280,550 lb.
	90,910 kg.	127,250 kg.

Told suggests 6m³ 00 (212 cu. ft.) or 2850 kg. (6283 lb.) of brick per cubic meter (35.3 cu. ft.) of air per second per 100 deg. Cent. (180 deg. Fahr.) rise in temperature. According to this rule the checker brick would be:

$$2850 \times 8.51 \times 9 = 218{,}250 \text{ kg. } (478{,}900 \text{ lb.})$$
$$6 \times 8.51 \times 9 = 459 \text{ m}^3 55 \text{ } (16{,}228 \text{ cu. ft.})$$

	Gas on Gas	Air on Air	Gas on Waste Gas	Air on Waste Gas
The free volume required for the passes may be determined:				
Q_0 of gas, air, products of combustion, cu. ft. = ...	188	300	181	270
$t°$ average in checker, Deg. Cent.	850	750	1,200	1,100
Deg. Fahr.	1,562	1,382	2,192	2,012
$1 + at$ for average $t°$	4.120	3.753	5.404	5.037
$Q_t = Q_0 \times (1 + at)$ = cu. ft.....	775	1,126	978	1,360
Temperature change, average, Deg. Cent.	700	900	800	1,000
Deg. Fahr.	1,260	1,620	1,440	1,800
With a temperature change of 360 deg. Fahr. (200 deg. Cent.) per second, the average time in the checker will be, seconds	3.5	4.5	4.0	5.0
Basing the pass volume on the gas and air heating time, the volume required = cu. ft.	2,713	5,067	....	....

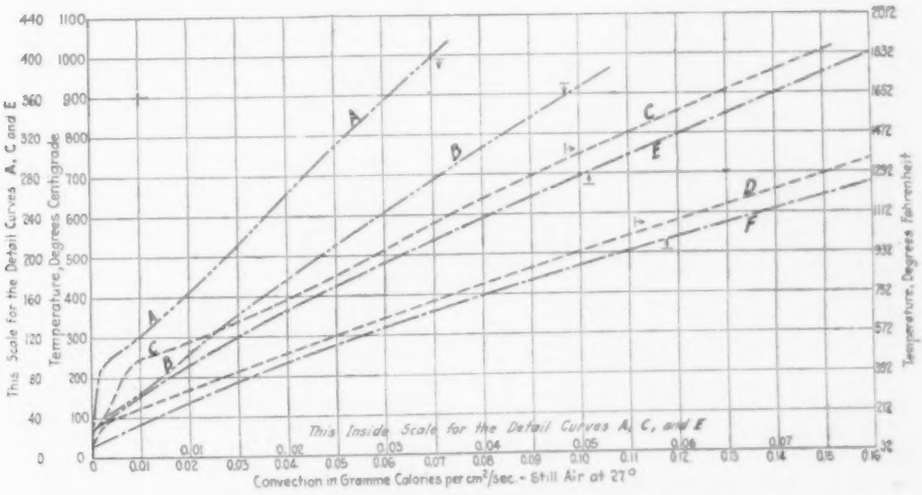

This Scale for the Detail Curves A, C and E
Temperature, Degrees Centigrade
Temperature, Degrees Fahrenheit
This Inside Scale for the Detail Curves A, C, and E
Convection in Gramme Calories per cm²/sec. - Still Air at 27°

Fig. 4. Convection Factor Curves Based on Longmuir Experiment

This last is reasonably close to the quantities arrived at, providing Told referred to the chambers at one end only.

The weight of the checker brickwork will be determined upon the basis of a temperature change of 200 deg. Fahr. (111 deg. Cent.), 70 per cent of the brick being considered effective. The specific heat average of fire brick is about 0.25. Its weight, 112 lb. per cu. ft. = 1800 kg. per cu. m.

15 minute, 900 second cycle:

	Gas, Lb.	Air, Lb.
Gas: 6,937,000 ÷ [200 × 0.25 × 0.70] =	198.180	.....
Air: 12,690,000 ÷ [200 × 0.25 × 0.70] =	.....	362,580
20 minute, 1200 second cycle:		
Gas: 9,250,000 ÷ 35 = ...	264.260	.....
Air: 16,920,000 ÷ 35 = ...	.....	483,400
25 minute cycle, 1500 seconds:		
Gas: 11,562,000 ÷ 35 = ...	330,300	.....
Air: 21,150,000 ÷ 35 = ...	.....	604,250

The volume occupied by the checker brick = weight × 1 ÷ 112 = 0.008929 P.

On this basis, the cubic feet of brick required =

For 15 minute, 900 second cycle.....	1,770	3,237
20 minute, 1200 second cycle.....	2,360	4,316
25 minute, 1500 second cycle.....	2,949	5,395

*Box 92, Newark, N. J.

Regenerators Continued	Gas	Air
Average time in checker of waste gases, revised to pass volume: Seconds =	2.774	3.726
Average temperature change per second, revised: Deg. Cent.	288	268
Deg. Fahr.	518	482
Total checker volume = pass volume plus brick volume:		
for 15 minute cycle = cu. ft.	4,483	8,304
for 20 minute cycle = cu. ft.	5,073	9,383
for 25 minute cycle = cu. ft.	5,662	10,462
The percentage volume and area of passes and brick will be = 15 minute cycle, brick =	39.48	39.00
passes =	60.52	61.00
20 minute cycle, brick =	46.53	46.02
passes =	53.47	53.98
25 minute cycle, brick =	52.08	51.57
passes =	47.92	48.43
To provide a margin for contingencies, the 25 minute cycle will be used. Using square passes, the side of the square for the pass unit will be = $\sqrt{0.4792}$ = ...	0.6923	.....
= $\sqrt{0.4843}$ = ...	.....	0.6960
Portion of unit square occupied by brick = 1.0000 — 0.6923 =	0.3077	.....
1.0000 — 0.6960 =	.....	0.3040
Making the wall between the passes 2.5 in., and making passes for both chambers alike, the side for the unit square = 2.5 ÷ 0.3077 = ...	8.125 in.	
The brick thickness = ...	2.500 in.	
Side of square pass = ...	5.625 in.	

Table I.—Regenerator Computation

	Gas on Gas	Air on Air	Gas on Waste Gas	Air on Waste Gas
Temperature assumptions:				
Top of checker,				
Deg. Cent.....	1,200	1,200	1,600	1,600
Deg. Fahr.....	2,192	2,192	2,912	2,912
Bottom of checker,				
Deg. Cent.....	500	300	800	600
Deg. Fahr.....	932	572	1,472	1,112
Average,				
Deg. Cent.....	850	750	1,200	1,100
Deg. Fahr.....	1,562	1,382	2,192	2,012
Change,				
Deg. Cent.....	700	900	800	1,000
Deg. Fahr.....	1,260	1,620	1,440	1,800
Heat capacity of gases, in B.t.u. per cu. ft., from curve Fig. 1, THE IRON AGE, page 577, March 2, 1922.				
Waste gases at Deg. Cent. Deg. Fahr. 1600 (2912)	....	....	183	183
Air or gas at Deg. Cent. Deg. Fahr. 1200 (2192)	50	73	....	....
Waste gases at Deg. Cent. Deg. Fahr. 800 (1472)	....	....	80	....
Waste gases at Deg. Cent. Deg. Fahr. 600 (1112)	....	....	....	58
Producer gas Deg. Cent. Deg. Fahr. 500 (932)	19	....	....	....
Air supply at Deg. Cent. Deg. Fahr. 300 (572)	....	17	....	....
B.t.u. absorbed by gas or air, given off by waste gases	31	56	103	125
B.t.u., assuming two units of gas burnt				
= 31 × 2 =....	62	....	....	....
= 56 × 2 =....	....	112	....	....
B.t.u. total required and available				
= 62 + 112 =..	....	174	....	....
= 103 + 125 =..	....	....	228	....
Percentage required for gas				
62 ÷ 174 = ...	35.63	....	....	....
Percentage required for air				
112 ÷ 174 = ...	....	64.37	....	....
B.t.u. required for gas =				
228 × 0.3563 = ..	....	....	81	....
B.t.u. required for air =				
228 × 0.6437 = ..	....	....	....	147
Percentages from waste gases				
81 ÷ 103 = ...	....	....	78.64	....
147 ÷ 125 = ...	....	....	....	117.60
Reducing to basis of 100	....	....	40.08	59.92
B.t.u. per cu. ft. gas burnt =				
103 × 0.4008 =	....	....	41	....
125 × 0.5992 =	....	....	....	75
Volume per second of gas, air and products of combustion, 32 deg. Fahr., 29.92 in. barometer —				
gas, cu. ft.....	188	....	....	....
air, cu. ft.....	....	300	....	....
Products of combustion:				
451 × 0.4008 = cu. ft.	....	....	181	....
451 × 0.5992 = cu. ft.	....	....	....	270
B.t.u. per second required =				
188 × 31 = ...	5,828	....	....	....
188 × 56 = ...	....	10,530	....	....
188 × 41 = ...	....	....	7,708	....
188 × 75 = ...	....	....	....	14,100
B.t.u. per cycle =				
15 min. = 900 sec.	5,245,000	9,477,000	6,937,000	12,690,000
20 min. = 1200 sec.	6,994,000	12,636,000	9,250,000	16,920,000
25 min. = 1500 sec.	8,742,000	15,795,000	11,562,000	21,150,000

Any change in the assumptions made will alter these values in a corresponding manner. The change in temperature of the gas and air and the waste gases will vary the quantity of heat available. The cyclic change in temperature may be varied, and this will change the volume of brick required to store up the heat, and the surface required for heat interchange. The heat storage capacity must be sufficient to supply the desired preheat and the loss through the chamber walls, when on air or gas. Too much checker adds to first cost. Too small a checker increases operating cost. The conditions will be changed by other fuels, as well as by changes in the ratio of the air supply.

As the unit pass has been made the same for both of the chambers, the volume of brick and pass for the air checker will be changed slightly, as follows:	Gas	Air
Brick volume = 10462 × 0.5208 = cu. ft.		5449
Pass volume = 10462 × 0.4792 = cu. ft.		5013

The pass unit will be different with different wall thicknesses, and several variations might be tried in arriving at a desirable arrangement. The lineal amount of checker is found by dividing the brick and pass volumes by the area of brick and pass in a unit pass:

	Gas	Air
Area of unit pass = 8.125 in. × 8.125 in. ÷ 144 = 0.45844 sq. ft.		
Area of pass = 5.625 × 5.625 ÷ 144 = 0.21973 sq. ft.		
Area of brick = difference = 0.23871 sq. ft.		
Lineal ft. brick for		
gas = 2949 ÷ 0.23871 =	12,353 ft.	.....
air = 5395 ÷ 0.23871 =	.....	22,600 ft.
pass for gas = 2713 ÷ 0.21973 =	12,347 ft.	.....
air = 5067 ÷ 0.21973 =	.....	23,070 ft.
A checkerwork height of 23 ft. has been assumed, to illustrate the effect of the high checker. On this basis the number of passes will be:		
for gas = 12,347 ÷ 23 =	537	.....
for air = 23,070 ÷ 23 =	.....	1003
The ground area occupied by the checkerwork will be:		
for gas = 5662 ÷ 23 = sq. ft.	246.35	.....
air = 10462 ÷ 23 = sq. ft.	.....	454.90

Any convenient length or width of chamber that will give this area may be used. Preferably, when a square pass is used, the length and width of the chambers should be multiples of the pass dimensions, the length of both chambers being the same. The chamber length will be: $(8.125n + 2.5) \div 12 = l$, in which n = number of passes. Preferably, the number of passes should be changed to give an even number of passes in the width and length.

	Gas	Air
Let n = 40, then l = 27 ft. 3½ in. =	27.29 ft.	
For the width let n = 14 and 26, then l = ...	9.48 ft.	17.60 ft.
The nearest inch values would be used in practice, but the decimals of a foot are here used for convenience.		
The number of passes will revise to..	560	1,040
The area occupied will revise to, sq. ft.	258.70	480.30
The checker volume will revise to, cu. ft.	5,950	11,040
The heating surface per pass = sq. ft.	44.06	
The total heating surface in sq. ft. =	24,675	45,830
The total area in the passes = sq. ft.	118.63	228.51
Perimeter of one pass, lineal feet.....	1.875	
Perimeter, total in lineal feet.....	1,012.6	1,950.0
Average velocity, ft. per second, gas and air = ...	6.532	4.928
Waste gases = ...	8.243	4.971
Meters per second, gas and air = ..	1.99	1.50
Waste gases = ...	2.51	1.52

For the usual checker construction, the method of arriving at the heating surface is somewhat similar to the above, the space occupied by the brick being $0.5208 \div 0.29 = 1.79$ rows per foot; and the gage or space between being $0.4792 \div 1.79 = 0.2677$ ft. = 3 3/16 in. (about).

From these figures the heating surface may be arrived at, as well as all of the other data necessary in determining the size of the checker chambers for gas and air. When properly laid to secure stability, a 9-in. shape makes a checker which gives the maximum heat storage utilization of the volume occupied.

Regenerators Continued	Gas on Gas	Air on Air	Gas on Waste Gas	Air on Waste Gas
Heat transfer per second				
Total B.t.u. = ...	5,828	10,530	7,708	14,100
Per sq. ft. B.t.u. = ...	0.2362	0.2298	0.3124	0.3077
Per m², calories = ...	0.6407	0.6233	0.8474	0.8346
Average temperature differential gas to brick or brick to gas:				
Deg. Cent.	175	175	175	175
Deg. Fahr.	315	315	315	315
Convection factor to still air, according to Langmuir curve, Fig. 4, calories per m² per sec.	0.294			
Correction factor for velocity = $K = \sqrt{\frac{35 + v}{35}}$ =	2.59	2.30	2.86	2.31
v = velocity in cm. per second				
Convection corrected for velocity in calories, per m² per second	0.7615	0.6763	0.841	0.6792
In B.t.u. per sq. ft. per sec.	0.2807	0.2493	0.310	0.2504

These transfer values seem to indicate the provision of sufficient heating surface for the desired rate of heat transfer to take place. Langmuir's work is probably as accurate as obtainable, but the writer has assumed that his temperature differential holds with higher initial temperatures, his values being based upon still air at 80 deg. (27 deg. Cent.). Whether these assumptions are correct or not cannot be fixed without further research.

All of the computations are based upon an assumed rate of fuel consumption, and will vary as that rate changes. Other variations will be introduced by different fuels, and different working conditions, than those which were fixed initially for the base of the computation. However, there is no basic reason why the design of a furnace cannot be reduced to rational methods. When the method of operation and the design are fixed, it is possible to predict the fuel consumption within a reasonable margin, as well as the performance of the furnace as a heat-tranfer apparatus. The main difficulty in arriving at the heat losses from the exterior walls of the checker chambers arises more from their exposure to stray air currents and variations of the cycle of operation. When the cycle is fixed, these losses can be reduced to mathematical analysis.

Observations on the Surface of Liquid Steel*

Microscopic Examination of Particles Thrown Off—Optical Pyrometer Observations

BY COSMO JOHNS

THE appearance of liquid steel as it flows from the launder of an acid open-hearth furnace was described in a communication by the author to the Faraday Society,† while the evidence for the existence of the vapor of iron or steel was reviewed in the course of a lecture‡ to the West of Scotland Iron and Steel Institute. Attention was specially drawn to the fact that an optically clean surface can be observed to persist for an appreciable length of time.

An optical pyrometer using monochromatic light of a suitable wave length is a very convenient instrument for exploring such a liquid metal surface. The higher the temperature of the steel the longer does the liquid steel preserve its oxide-free surface. This can very conveniently be studied if a small quantity of liquid is poured into an open chill mold. If the temperature is sufficiently high and the pouring carefully done, the upper surface remains clear for several seconds, but, as the freezing point is approached, an oxide film begins to form and soon covers the surface. The same thing can be observed when liquid copper is poured into an open mold and is allowed to freeze.

The preservation of the optically clean liquid metal surface was attributed by the author to the presence of the vapor of the metal, and the subsequent formation of the oxide film to the lowering of the vapor pressure as the freezing point of the liquid metal was approached. The presence of vapor of iron or steel above the bath of the open-hearth furnace seemed necessary to explain the gradual accumulation of oxide of iron, chiefly Fe_2O_3, in the pores of the silica bricks that line the hearth, and the well-known emission of reddish-brown iron oxide fume from the chimney during the stage in manufacture known as the boil.

When, however, this apparently rather obvious explanation was again advanced§ it failed to secure acceptance, and a marked divergence of views was apparent among those taking part in the discussion which followed. Professor H. Louis doubted the possibility of iron vapor being formed, and suggested the possibility of the formation of iron carbonyl. Dr. W. H. Hatfield could not agree as to the vaporization of iron, and said that if a stream of metal were watched the conviction grew that the occluded gases were coming off and protecting the stream, and that if iron vapor were present there would be ocular evidence of its combustion and the formation of oxide.

Professor Carl Benedicks thought that the main reason for the preservation of the surface was that the stream carried the air along with it, and that it was not running through air, but was protected by a covering of nitrogen. Only E. H. Saniter agreed with the author, that the facts could best be explained on the assumption of the vaporization of iron.

In the face of this divergence of opinion, it was clear that further experimental evidence was desirable, and the object of this communication is to submit this further evidence. When a stream of steel, such as has been described above, is closely observed, a continuous shower of brilliant sparks can be seen to be ejected from the surface. Most of them end their flight as luminous objects by exploding with a brilliant flash. The length of the flight depends, of course, on their initial velocity and angle of emergence, but it is also related to the temperature of the steel and its chemical composition. The "sparks" can be collected in the exploded state and also examples found where disruption had not occurred.

From their examination it could be seen that the miniature explosion, which had ended the luminous career of so many, was caused by the accumulation of gas in the interior globule of steel during its oxidation in the course of its flight through the air, and that the hollow sphere of iron oxide had ruptured when the pressure became too great. Sometimes rupture occurred with the formation of two hemispheres and sometimes by the blowing out of a portion of the shell less in size than a hemisphere.

The most probable explanation is that small globules of the steel are detached as a result of turbulence, and projected away from the surface as spray. These globules during flight would become oxidized and the gaseous products of the combustion of the carbon would accumulate in the interior, as oxidation progressed from outside to inside. It is just possible, however, that this explanation is not complete, and that their life history is not so simple.

Now, above the stream of steel, and easily distinguished from the sparks, a well-defined fume can be seen, rising like smoke from the liquid metal surface and floating away to a considerable distance. It is evolved in greatest quantity near the tap-hole where it emerges into the air. There does not appear to be any graduation from "sparks" to fume; the sparks are distinct entities and can be separately distinguished from the fume. Samples of the fume were, therefore, collected—a few sparks would be included, but they would not be many in number. The sample could be collected on suitable collecting surfaces placed some distance away, but as the sample would represent only the portion that had been sorted out by gravity at that particular point it might not be representative. A simpler method was to use a magnet and collect the fume a few feet above the surface of the steel.

An examination of the samples made it clear that the method of collection could be decided by convenience alone, for the fume was found to consist of small globules of iron oxide, most of them beautifully spherical. When the collection was made by allowing the falling particles to be caught on a receiving surface, the size of the globules did not vary much, and the absence of extremely small spheres was noticeable. The fume collected with a magnet over the stream contained examples of all sizes, including a few "sparks," which could be distinguished.

There was, however, one very striking difference in habit between the globules, constituting the fume, when

* A paper read before Section B of the British Association, at Edinburgh; Reprinted from *Engineering*.

† Cosmo Johns, "The Determination of the Temperature of Liquid Steel under Industrial Conditions." Transactions of the Faraday Society, Vol. XIII., 1918.

‡ Cosmo Johns, "The Solid and Liquid States of Steel," Journal of the West of Scotland Iron and Steel Institute. Lecture delivered December 20, 1918.

§ Journal, Iron and Steel Institute, No. 11, 1919, page 189 *et seq.*

collected with a magnet and those caught at a distance on a receiving surface. Those collected by gravity displayed no tendency to adhere or to attract each other. Owing to their spherical form it was difficult to retain them on a glass slide for examination.

On the other hand, those collected with a magnet displayed a marked tendency to run together and form straight or curved lines, in which spheres of all sizes could be seen. Occasionally small groups of these little spheres could be observed, but the more common habit was to string themselves out in straight or curved lines, which could be moved about on the glass slide without coming apart, unless the length of the string of spheres was excessive.

This habit of adhering, and forming strings or groups, on the part of the globules that cooled in a magnetic field appears to be similar to that recently described by Professor Elihu Thomson* as characteristic of the "smoke" given off by the iron arc when used for electric welding. The agglomerating habit is, therefore, to be ascribed to the cooling of the iron oxide globules in a magnetic field which has rendered them magnetic.

The investigation was now directed to determining the origin of the fume. If it proved to be a form of spray, finer than the larger form which gave the sparks, then no light would be thrown on the nature of the medium, if any, protecting the surface of the liquid steel from oxidation. If, however, it could be shown that the minute globules represented the vapor phase of the metal after condensation and oxidation, an explanation would have been found. Samples of steel were, therefore, carefully collected from steel of varied but unknown composition.

Now, an analysis of the fume, when recalculated to an oxygen-free basis, would enable fume and original steel to be compared. If the fume was mere fine spray, then the oxygen-free fume and original steel would have analyses in substantial agreement. If the fume represented condensed and oxidized vapor, then differences should appear for, on theoretical grounds, the various metals which are soluble in iron and can be investigated, in various concentrations, as alloy steels, would not be expected to vaporize at the same relative rate.

Fume samples from several steels of varying compositions were collected and analyzed.† When recalculated to an oxygen-free basis, they were all consistent in that the alloy metals differed as regards their percentage from those in the original steel, and made it clear that the fume in great part, if not almost entirely, represented the condensed and oxidized vapor of the steel.

As the investigation will be continued, only one analysis will be given here, and that one contains the largest number of dissolved metals. The sample was carefully collected, and the oxide globules separated from the small quartz and fireclay particles and other impurities, which had been swept up from the sides of the launder by the strong convection currents found near the liquid steel. The ratio of the percentage of each metal in the original steel and its percentage in the fume, recalculated on an oxygen-free basis, was as follows:

Element	Original Steel	Fume
Tungsten	1	0.58
Chromium	1	0.97
Iron	1	1.00
Nickel	1	1.23
Manganese	1	2.50

These values should be regarded as approximate only.‡ They serve to decide the point at issue, for they can represent only the vapor of a complex alloy steel whose constituents have evaporated at differential rates. They cannot possibly be construed as proving that the fume is the oxidized spray of the steel. As in many other recorded investigations, the solution of the immediate problem in hand only serves to suggest many new ones. Though it is proved that the fume does represent the condensed and oxidized vapor of the steel, it does not follow that the ratios tabulated give the absolute rate at which each of the metals evaporate at the temperature of liquid steel.

There are difficulties in securing samples sufficient in weight for reliable analyses from steels of known composition. When collected with a magnet any non-magnetic material in the fume would escape collection. If the cooled fume be collected as it falls at some distance, then gravity separation would have been effected and the result is unknown. Collecting the fume by aspiration or some other method from near the surface of the steel involves difficulties which have not been overcome. Thus there are considerable difficulties in collecting the sample. Then the results which have been obtained suggest that the degree of concentration of the various metals have some effect on the rate of evaporation, and it is just possible that the presence of other elements in the solution is a factor not entirely negligible.

A search through relevant literature, admittedly not complete, failed to disclose any experimental work on the nature of the vapor of alloy steels. Our knowledge of the state of molecular association of the elements, in such a complex liquid alloy as that studied, is practically nil. What is clear, however, is that a most interesting field of research has been opened out. The work is of great scientific interest, but it also has important industrial applications. The use of optical pyrometers for the determination of the temperature of liquid metals has been successful only where the method of observation has been standardized, and the pyrometer readings used directly for comparison without any attempt being made to apply corrections to obtain real temperatures.

The presence of the vapor of the steel as a protecting atmosphere around the stream would mean that the absorption of the light emitted by the liquid metal would vary with the angle of observation. The condensed and oxidized vapor rising in a cloud would also mean considerable absorption of light. The phenomena are not confined to steel, for they should be still more marked with the non-ferrous alloys, especially those containing the more easily vaporized elements, and possibly explains the difficulty experienced in applying optical methods for the determination of their apparent or real temperatures.

* *Nature*, June 23 and July 14, 1921.

† I have been much indebted to J. H. Huxley, F.I.C., A.R.S.M., under whose supervision the several analyses were made, for the interest he has taken in the investigation.

‡ A less complete series of varying ratios was communicated at the time the paper was read.

Papers to Be Read at Foreign Trade Convention

"A Foreign Trade Policy for Americans" will be the subject of an address by James A. Farrell, president United States Steel Corporation, at the ninth National foreign trade convention in Philadelphia, May 10, 11 and 12, over which Mr. Farrell will preside. His address will be the keynote of the campaign for a great business and industrial revival in this country.

Mr. Farrell will emphasize the necessity for a definite foreign trade policy if America's export trade leadership is to continue. He will stress the importance of foreign trade to the prosperity, not only of American industries but to the public in general.

Financing and expansion of the nation's overseas commerce is the primary purpose of the convention. It will be a working gathering from the opening to the final session.

Charles M. Muchnic, vice-president American Locomotive Sales Corporation, will make an address on "The Factor of Depreciated Currency in Competition."

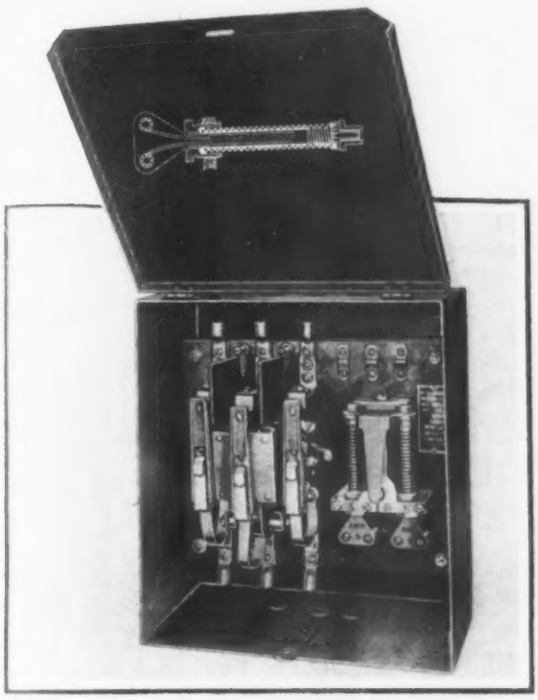
Under the general topic of export sales promotion, J. W. Mason, vice-president American Surety Co., will talk on "Bonded Service as a Selling Argument." "The Essentials of a Market Survey" will be discussed by William Menkel of the Association of National Advertisers.

New concrete docks and warehouses will be constructed in the Parana River ports of Baradero and Villa Constitucion, Argentina, for the accommodation of river boats, according to Trade Commissioner George S. Brady. The work will be under the direction of the Argentina director of navigation and ports, and approximately 700,000 pesos will be spent at each port.

Thermal-Limit Motor Starter

A thermal-limit starter which is said to permit an induction motor to exert six or seven times its normal power for a limited period, at the same time protecting it from a prolonged overload as small as 25 per cent, has been developed by the Monitor Controller Co. of Baltimore. The device is also said to take care of changes in temperature automatically, protecting the motor under all conditions of operation.

The starter, known as the Thermaload, is shown in the accompanying illustrations, and consists of a 3-pole



The Starter Consists of a Three-Pole Magnetic Contactor and a Thermal Limit Relay. The expansion unit is shown in the insert in the cover

magnetic contactor and a thermal-limit relay, mounted on a slate panel and inclosed in a metal cabinet. It is operated by push buttons from one or more points. The apparatus is said to give overload and low-voltage protection, prevent damage from single-phase running of polyphase motors and yet give full current, full voltage and full-torque start. It is available in all sizes up to 3 hp. 110 volts single phase, 5 hp. 220 volts single phase, 110 volts polyphase, 10 hp. 440 volts single phase, 220 volts polyphase. All sizes are available in voltages up to and including 550 volts.

The thermal-limit relay consists essentially of two units which expand between a fixed support and a hinged contact arm, the arm being arranged in a way to multiply the motion of the expansion units several times at the contact. Each expansion unit consists of a double-wall tubular receptacle, the inner wall being smooth and closed at one end and the outer wall corrugated and closed at both ends, the construction being shown in the insert. The space enclosed between the walls is filled with tetra-chloride of carbon, a non-corrosive, non-freezing liquid. The thermal element which operates the expansion unit consists of a form-wound coil of asbestos-insulated wire attached to a piece of insulating material by brass eyelets which are formed under pressure around the end of the wire, forming the terminals. These eyelets register with two brass binding posts and are clamped by brass screws. The binding posts furnish mechanical support as well as serving as electrical connections.

The full-load rating of the thermal element is stamped on the sheet insulation and all elements have the same mechanical dimensions. A relay can be changed from one rating to another merely by inserting the proper elements. The small amount of power required to operate the relay, 2.14 watts, is said to be an outstanding feature. The resistance also is said to be extremely low and likewise the voltage drop. The low resistance permits using resistance wire of large diameter, affording a self-supporting element, capable of withstanding rough usage.

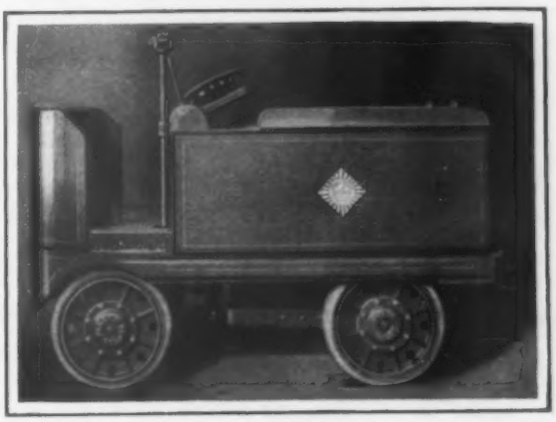
Develops Heavier Storage-Battery Tractor

There is a tendency to use the electric storage-battery tractor in harder service than heretofore, they often being called upon to operate in soft-dirt yards, in pulling loads up inclines and under other similar heavy-duty conditions. For this service a new and heavier tractor, built in two models, has been placed on the market by the Elwell-Parker Co., Cleveland.

The 4-wheel tractor for steel-plant or foundry service is shown in the illustration, the other model being a 3-wheel machine for heavy duty around the congested floors of a warehouse. As compared with the company's other types the new design is characterized by several new features.

The battery compartment has openings at both the top and back so that the battery can be taken out either way. Solid side plates are used instead of loose plates that are in danger of being torn off in case the tractor rubs against some obstruction. The dash grooves into a wood bumper strip set in the side channel of the frame, this bumper strip being protected by a ¼-in. metal strip. The weight of the motor has been increased 65 lb. An additional safety feature is that when the operator leaves his seat he not only opens the circuit breaker but sets the brake.

A new type of spring suspension is provided. Coil springs are used in which oil-saturated wool waste is packed, the oil from which runs down through the axle blocks to the axle guides which are provided with renewable liners. This permits a side sway of the truck without forcing the wheels out of alinement. The 3-wheel tractor has a spring suspension on the fork of the single front wheel similar to the rebound spring fork of a motorcycle. The power plant is supported on this forward end by a ball socket. A ball and socket steering rod extends from the lower end of the



When the Operator Leaves the Seat the Circuit Breaker Opens and the Brakes Set

steering column to a single lever attached to the center of the axle, with right and left ball and socket reach rods connected to the wheel knuckles. A pressure oiling system is used.

The 4-wheel tractor has 2-wheel steer and 2-wheel drive. Its draw-bar pull capacity is 675 lb. normal, and 2600 to 2700 lb. maximum and its no-load speed is 530 ft. per min. Its weight with Edison battery is 4375 lb. The 3-wheel tractor has a draw-bar pull capacity of 450 lb. normal and 1800 to 1900 lb. maximum and a no-load speed of 600 ft. per min. It swings on a 5 ft. 4 in. radius. Its weight with Edison battery is 3050 lb. Both types have three speeds in either direction.

SILICA AND FIRE BRICK

Production and Other Statistics of Refractories Manufacturers' Association

CHARTS prepared by the Refractories Manufacturers' Association, giving production, shipments and stocks, new orders minus cancellations, unfilled orders, new orders and cancellations of fire clay and silica brick have been issued covering the month of January, and going back to January, 1919.

In January this year shipments of fire clay brick reached 40 per cent of the monthly economical producing capacity, exceeding production by about 2 per cent, while there was a decrease of about 3 per cent in the stock. New orders ran above 40 per cent of producing capacity, resulting in a slight gain in the

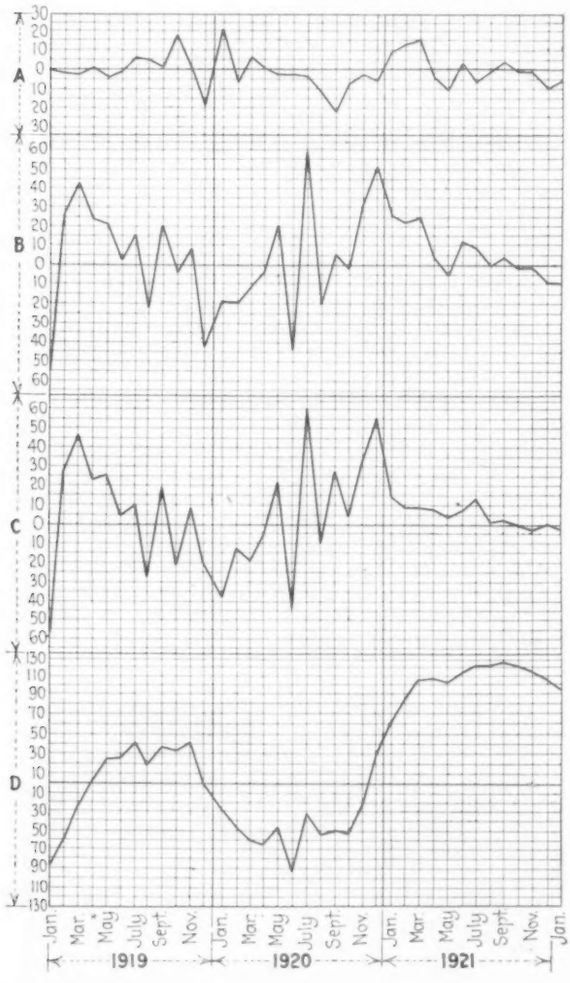


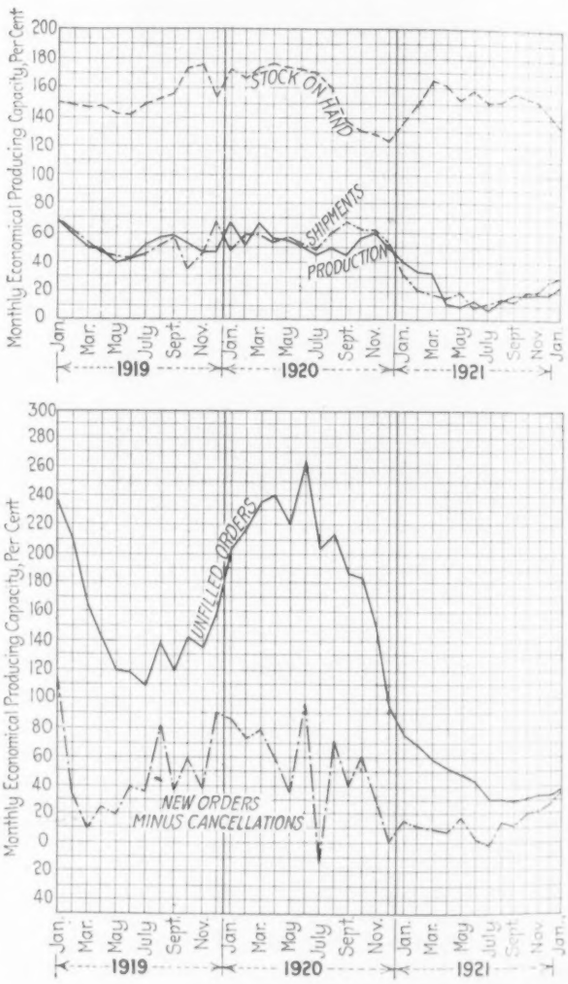
Chart "A" Shows the Divergence of Production and Shipments. Where production exceeds shipments, the degrees of divergence are shown above the zero line, and vice versa. Chart "B" shows the divergence of production and new orders. Where production exceeds new orders, the degrees of divergence are shown above the zero line, and vice versa. Chart "C" shows the divergence of shipments and new orders. Where shipments exceed new orders, the degrees of divergence are shown above the zero line, and vice versa. Chart "D" shows the divergence of stock and unfilled orders. Where stock exceeds unfilled orders, the degrees of divergence are shown above the zero line, and vice versa

unfilled orders, since cancellations were practically nil. The silica brick chart shows similar drifts. Shipments reached 30 per cent of capacity and, while production moved upward, it was less than the gain in shipments and there was a substantial decline in stocks. Unfilled orders increased, since new orders gained and, like fire clay, cancellations were unimportant.

These data are furnished not only to the members of the association, but also to the Department of Commerce. The figures are based exclusively on reports from members of the association and, while not a full report on the industry, furnish an excellent picture of the activities of a large majority of refractories manufacturers. The 1919 and 1920 figures are based on a normal output of 25,448,833 silica brick; the 1921 figures on 27,305,500 brick. For fire clay brick, the 1919 figures are based on an output of 71,572,186 brick; the 1920 figures on 73,526,103, and the 1921 figures on 78,645,942 brick; all expressed in 9-in. equivalents.

Tandem Cold Strip Mills for Worcester Company

New precision 6 x 4-in. tandem cold rolling mills for flat strip steel which are being built by the United Engineering & Foundry Co. for the Worcester Pressed Steel Co., Worcester, Mass., will be installed ready for operation about May 10. An exclusive feature is the adjustment of the rolls by means of wedges instead of screws. This is to insure an accurate adjustment of the rolls for gage and to eliminate the lost motion possible with screw adjustment. The mills will be equipped with steel rolls 6 in. in diameter, with 4 in.


Monthly Economical Producing Capacity, Per Cent
STOCK ON HAND
SHIPMENTS
PRODUCTION
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan.
1919 1920 1921
Monthly Economical Producing Capacity, Per Cent
UNFILLED ORDERS
NEW ORDERS MINUS CANCELLATIONS
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan.
1919 1920 1921

Charts for Silica Brick; the Charts for Fireclay Brick Are Similar

face, the maximum width of stock that will be rolled on these mills being 3⅝ in. The wider and heavier sizes will be produced in the Worcester company's present equipment of two-high and three-high mills, which produce strips from 3 to 15 in. with a capacity of 70 tons per day.

The minimum delivery speed of the mills operated in tandem will be 201 ft. per minute, while the maximum may be 350 ft. per minute. Each mill will be driven by a 60 to 70-hp. adjustable speed direct-current motor controlled by a special automatic controller. The motor driving the No. 1 mill has a 1.69 to 1 range in speed and the motor driving the No. 2 mill has a 2 to 1 range. A new motor driven coiling reel will be installed with these mills. This reel will be fitted with a spool only 8 in. in diameter to produce tight small core coils for annealing or shipping without the necessity of an extra recoiling operation.

PITTSBURGH BASING POINT

Northwestern Companies Claim Practice Prevents Competition

MINNEAPOLIS, March 10.—Hearings of the Federal Trade Commission in the taking of testimony in its complaint against the United States Steel Corporation, in the Pittsburgh basing point case begun here March 1, were brought to a close yesterday. Examiner J. W. Bennett adjourned the hearing to March 20, when it will be resumed in Chicago.

The second week of the testimony taking was somewhat livelier than the first week, the prosecution saving its most important witnesses until toward the close of the session. Railroad, State and county officials were brought into the second week and officials of the Minneapolis Steel & Machiney Co., Minneapolis, and American Hoist & Derrick Co., St. Paul, also added interest to the hearing.

Probably outstanding among the individual witnesses was George M. Gillette, president Minneapolis Steel & Machinery Co., who has been a fabricator of steel for 32 years and who has consistently and vigorously opposed the Pittsburgh basing practice since its inception about 20 years ago.

Mr. Gillette was the principal witness on the final day of the hearing. He made the assertion that several independent steel rolling mills acting independently and competitively could compel the United States Steel Corporation to cease its Pittsburgh basing practice. On the other hand, he said, the corporation could swing the independents to harmonize in any policy it promulgated.

Eighty per cent of the annual steel consumption of the Minneapolis Steel & Machinery Co., Mr. Gillette said, had been purchased from Duluth and Gary since the opening of the Duluth mill, and that prior to the opening of the Duluth mill, the bulk of the steel consumed by the company had been purchased in Gary. The trade field of his company, Mr. Gillette said, had gradually been reduced, as Eastern competitors took up the manufacture of lines which the Minneapolis concern was featuring. Foreign business, he said, had been practically wiped out in the last few years through the alleged advantage of Eastern competitors gained by the Pittsburgh basing practice.

Witnesses testified that the following alleged toll had been taken in Minnesota through operation of the Pittsburgh basing practice; $32,472 in school buildings erected in Minnesota from 1919 to 1921; $12,262 in steel in University of Minnesota buildings erected since 1916; $40,420 in bridges erected by the State Highway Commission in 1920; $33,920 in bridges erected by the State Highway Commission in 1919; an amount three times as great as that alleged to have been contributed by the State said to have been paid in by counties in bridge construction.

Samuel A. Challman, building inspector for the Minnesota Department of Education, testified that in the years 1919 to 1921, inclusive, school buildings erected in Minnesota cost $10,155,056.

A. H. Schuett, structural engineer for the same department, testified that 5077 tons of steel went into the buildings.

Downer Mullen, secretary of the Minnesota State Board of Control, said University of Minnesota buildings erected since 1916 cost $3,923,623. Mr. Schuett said the steel entering into the construction of these buildings was 1916 tons.

J. T. Ellison, bridge engineer for the State Highway Commission, testified that contemplated bridge construction in the next two years would far exceed that of the two previous years.

Both W. W. Corlett, general solicitor, and C. A. Severance, counsel for the corporation, objected strenuously to the admission of testimony such as that offered by Minnesota State officials regarding steel consumption on the grounds that it was irrelevant. Examiner Bennett noted the objections, but allowed the testimony to stand.

R. J. Elliott, assistant purchasing agent for the Northern Pacific, and E. T. Stone, purchasing agent for the Soo Line, testified as to the amount of the annual steel consumption of their roads, the latter placing his consumption at 2503 tons annually, and the former, his figure at 3200 tons annually, some items being excluded, however.

W. O. Washburn, partner in the American Hoist & Derrick Co., St. Paul, testified that his company had undergone the experience of witnessing its Eastern business dwindle to a negligible quantity, because, he said, of Eastern competition aided through the Pittsburgh basing practice. Machines sold by his company in the East, the principal field of trade for his products, Mr. Washburn said, were marketed only on their merits or through predetermined preference.

O. W. Morton, purchasing agent, American Hoist & Derrick Co.; R. B. Deatherage, purchasing agent, and E. H. Reudelsterz, sales manager, Puffer-Hubbard Mfg. Co., Minneapolis, and E. J. Ellertson, assistant secretary of the Russell Grader Mfg. Co., Minneapolis, were the other witnesses during the week.

The testimony, in general, was to the effect that competition to the east of Chicago by Northwest fabricators of steel was maintained at a loss to the Northwest competitors, whereas competition in the West with Eastern manufacturers was maintained with each about on an equal basis. Only in the immediate Northwest are the Northwest concerns at an advantage over Eastern competitors, it was asserted.

Mr. Severance and Mr. Corlett objected to any form of testimony not bearing directly on the competition issue, and in a few instances their objections were sustained. Frequently they were able to gain from the witnesses statements tending to discredit other bits of testimony and also to obtain admission of ability of the Northwest manufacturers to compete successfully in most sections of the country.

Slight Improvement in Pennsylvania

HARRISBURG, PA., March 13. — Conditions in the metal trade in Pennsylvania are believed to be on the verge of picking up, according to the semi-monthly report of the Pennsylvania State Department of Labor and Industry, just issued.

The metal trades show some improvement, according to this report, in most of the districts. Altoona, however, reports "no noticeable improvement." Erie said that there is a slight improvement, while Johnstown says that the industry "has shown considerable life" recently. McKeesport declared the iron and steel works are operating better than during all of 1921. "No particular change" was noted in Pittsburgh. The Harrisburg district reported 3900 men in the metal and machinery trade out of employment.

The number of unemployed throughout all of Pennsylvania showed a decrease of about 5000 during February, according to the bulletin. The unemployed on March 1 was 308,450 as compared to 313,835 on Feb. 1.

Secretary Hoover Will Stay in Cabinet

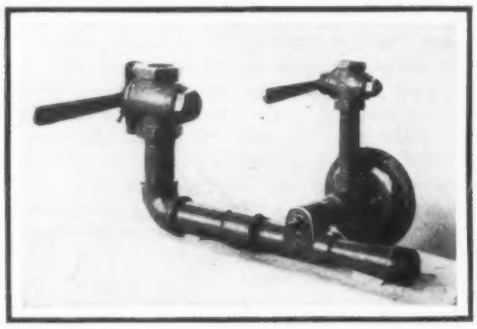
WASHINGTON, March 14.—In a letter addressed to Mayor J. Hampton Moore of Philadelphia last Friday, Secretary of Commerce Herbert Hoover declined the offer of the position as director-general of the Sesqui-Centennial exposition to be held in that city. Mr. Hoover stated that the President had strongly expressed the wish that he remain in the Cabinet, and added that he felt that, having undertaken the reorganization of the Department of Commerce in the hope that he may build it into a greater service for the community, he would not be justified in abandoning that task until it has reached further advancement. The offer made to Mr. Hoover carried an attractive salary.

A paper on "Ball Steel" was presented before the monthly meeting of the Detroit Chapter of the American Society for Steel Treating, March 13, by H. G. Freeland, metallurgist Hoover Steel Ball Co., Ann Arbor, Mich.

Air-Gas Inspirator for Gas Furnaces

The surface combustion low-pressure air-gas inspirator heretofore used exclusively on the furnaces of the Surface Combustion Co., 366 Gerard Avenue, New York, has been redesigned for use with any make of gas furnace. The device is shown in the accompanying illustration.

The manufacturers claim that this inspirator is essentially a gas furnace carburetor. The entire operation of a furnace equipped with this device is controlled through one valve. An increase or decrease of



Air-Gas Inspirator for Gas Furnaces

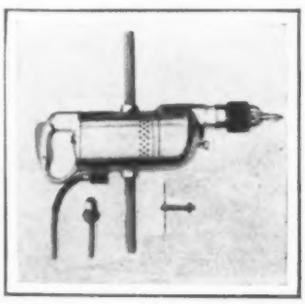
the air supply automatically increases or decreases the gas so that the mixture proportions remain in a constant fixed ratio. The gas cock is used only when starting or stopping and is either full on or full off; no adjustment of it is required. With this system it is said that no explosive mixtures are possible in any part of the distribution mains, as the gas and air are mixed only at the point of supply to the burners.

The advantages claimed are automatic supply of the exact proportions of air and gas to the furnace under all conditions of operation; thorough and homogeneous mixing just prior to entering the furnace, and instantaneous combustion.

Combination Portable Drill and Grinder

A combination portable electric drill and grinder is being placed on the market by the Wodack Electric Tool Corporation, Chicago.

The combination tool is shown in the illustration and is intended for drilling metal or wood. It has a drilling capacity of ⅛ to ⅝ in. in steel and when used as a grinder carries a 6 by ¾ in. grinding wheel. Two separate speeds are provided, slow speed for drilling and high speed for grinding. The motor which is of the universal type can be operated on both direct and



Combination Drill and Grinder. The motor can be operated on both direct and alternating current

alternating current of the same voltage and develops ½ hp. under load. The switch is located in the top handle and is of the quick make-and-break automatic-stop type permitting close control of the tool.

Aluminum castings and ball bearings are used throughout. The weight complete is 18 lb. All components, including the motor, are built at the company's factory.

The Bethlehem Spark Plug Co., Inc., Bethlehem, Pa., has contracted to fill the entire spark plug requirements of the Packard Motor Car Co., of Detroit. About 250,000 plugs are required each year.

Fluorspar in 1921

The fluorspar shipped from mines in the United States in 1921, according to Hubert W. Davis, of the U. S. Geological Survey, amounted to approximately 35,600 net tons, a decrease of 81 per cent as compared with 1920. The general average selling price per ton f.o.b. cars at shipping points for all grades of fluorspar in 1921 is estimated at $19.89, which is $5.37 less than the average price in 1920. The total shipments in 1921 were the lowest recorded for any year since 1908. The shipments from Kentucky exceeded those of Illinois for the first time since 1904.

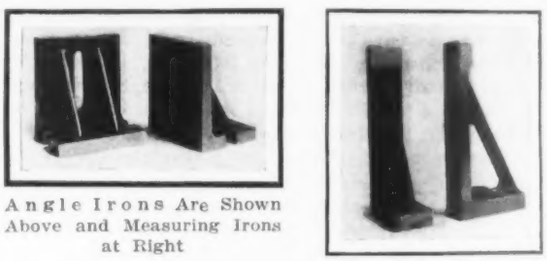
Imports of fluorspar into the United States in 1921 showed a decrease of 75 per cent as compared with those in 1920. The imports in 1921 were equivalent to about 22 per cent of the domestic shipments of fluorspar of fluxing grade, as compared with about 16 per cent in 1920.

Reports from steel manufacturers who produce about two-thirds of the basic open-hearth steel made in the United States show that they consumed 46,341 net tons of fluorspar in 1921, as compared with 80,545 tons in 1920. This group of steel manufacturers also reported stocks of fluorspar on hand Jan. 1, 1922, amounting to about 19,800 tons, as compared with 45,125 tons on Jan. 1, 1921. These reports therefore show that these steel plants consumed only 1,216 tons of fluorspar more than they had in stock at the beginning of 1921.

Precision Angle and Measuring Irons

The angle irons shown at the left in the accompanying illustration and the measuring irons at the right have been placed on the market recently by the Simplex Tool Co., Woonsocket, R. I.

The angle irons are of cast iron and carefully worked out to size, so that each size is shaped to accommodate the work intended for it. Three sizes are made from 4 x 5 x 5 in. to 8 x 10 x 12 in., and are de-



Angle Irons Are Shown Above and Measuring Irons at Right

signed to provide a variety of combinations suitable to the general run of work in any shop.

The measuring irons are designed to be clamped to the table of any machine and are said to be especially adaptable for accurate boring purposes. By setting them parallel to the machine table, they are useful in locating or measuring a variety of work and can be used also for clamping work that is to be machined. To facilitate setting up a slot for keys is provided in the bottom, as shown. The irons are of close-grained iron castings, with front face and bottom ground accurately and square. Two sizes are furnished, 2½ x 6 x 12 in. and 4 x 8 x 21 in.

The Republic Iron & Steel Co., Youngstown, Ohio, has blown in No. 4 blast furnace in its Haselton group at Youngstown on basic iron, due to increased merchant demands and broader open-hearth furnace operations, requiring more iron for steel-making. The company is now producing iron from two furnaces in this complement. No. 5 stack has been active for more than four years.

K. L. Flickinger, secretary-treasurer of the Niagara Stone Products Co., Youngstown, Ohio, announces that operations have started at the company's dolomite and limestone quarries at Bellefontaine, Ohio. Present capacity of the property is 500 tons of road stone per day and 100 tons of agricultural stone.

Chrome and Nickel-Molybdenum Steels*

Comparison with Other Alloy Steels for Automobile Use—Forging and Machining Qualities—Nickel-Molybdenum for Case-Hardening

BY C. N. DAWE

IN venturing to cover this pertinent subject it should be stated that there are so many more data yet to be obtained that it is impossible, at this time, to make a definite statement that fully covers the situation with regard to the application of commercial chrome-molybdenum steels. Such propaganda has been spread with reference to these steels and so much has been written regarding the history, possibilities, sources of supply and physical properties obtained, that there

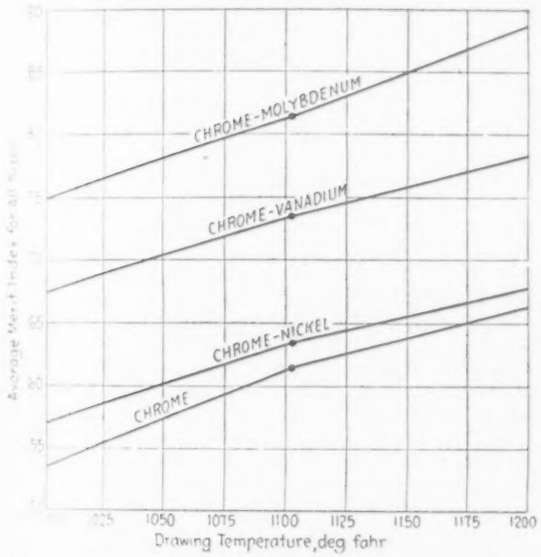


Fig. 1. Curves Showing the Relation Between the Drawing Temperature and the Average Merit Index for Various Alloy Steels

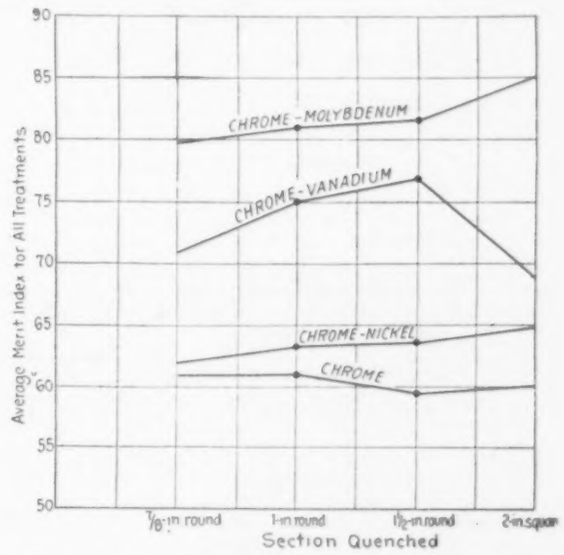


Fig. 2. Curves Showing the Relation Between the Average Merit Index of Alloy Steels and the Size of the Section Quenched

are many consumers as well as manufacturers who are looking on in a doubtful yet open frame of mind, desiring to gain further information, particularly with reference to application.

It is with this in mind that I present some actual data with reference to commercial molybdenum steel, noted from the viewpoint of a large consumer and not that of a fabricator or salesman. We, as consumers, attempt to strike rock-bottom and note what the material will actually do under production requirements.

I wish to emphasize the fact that every manufacturer of automobiles and automobile parts has his own peculiar problems and that frequently the means to an end in one plant is not applicable in another; therefore, there undoubtedly will be some criticism and discussion of the publication of the information given herein, although it is presented from a strictly neutral attitude and with no idea of promoting or discouraging the use of molybdenum steels.

A theoretical discussion of the causes of the manner in which molybdenum steels act will be avoided, since this phase already has been well covered by those whose opinions and discussions carry much more weight because of their many years of experience in the manufacture and application of molybdenum steels. For those who are sufficiently interested, it is recommended that the recent papers of Dr. John A. Mathews[1] and Dr. G. W. Sargent[2] be read.

Molybdenum Steel Usage

The Studebaker Corporation of America has had made and shipped to its plants over 2000 tons of molybdenum steels of various analyses. This steel has been put through production in the form of rear axle shafts, transmission gears and shafts, steering knuckles, steering-knuckle pins, ring gears and drive pinions; in fact, all parts for which alloy steel is specified.

Our first efforts were to determine the advisability of the adoption of that class of chrome-molybdenum steel which would be adaptable to heat-treated forgings such as steering knuckles, steering arms and rolled axle shafts, water quenching of these being desired. By a process of elimination it became clear that steel containing molybdenum approximating 0.30 to 0.40 per cent, with chromium 1.00 per cent and carbon above 0.30 per cent, should be avoided when water is desired as the quenching medium and where cracker shearing is used. An analysis showing a carbon content below 0.30 and above 0.23 per cent, with a chromium content of 0.70 to 0.90 per cent and molybdenum 0.30 to 0.40 per cent, gives satisfactory results with water as a quenching medium, there being no cause for concern pertaining to the development of quenching cracks.

As a rule, our first interest is turned toward the physical properties of a steel as compared to those with which we already are acquainted. Having this in mind, an extensive test was run involving the pulling of approximately 400 tension pieces turned from heat-treated stock varying in size from ⅞-in. round to 2-in. square. The sizes used were ⅞, 1 and 1½-in. rounds and 2-in. squares. The three smaller sizes were obtained by forging down from the 2-in. square hot-rolled forging bars. The 2-in. square test pieces were taken directly from the bar, no work having been put upon them.

Wide Treatment Range Not Necessary

The wide heat-treating range of a given steel is a

*From a paper presented at the annual meeting of the Society of Automotive Industries in New York, Jan. 10 to 13. The author is metallurgical engineer Studebaker Corporation of America, Detroit.

[1] See THE IRON AGE, Feb. 24, 1921, p. 505.

[2] See *Transactions American Society for Steel Treating*, vol. I, p. 589.

property upon which great stress always seems to be laid but, in our tests, no attempt has been made to determine this. In this present day of accurate metallurgical control we do not need a 100 to 200-deg. quenching range. What we as consumers are mostly interested in is to determine the lowest quenching temperature that can be used commercially and still obtain the maximum physical properties. With this in mind, quenching temperatures ranging from 1550 to 1650 deg. Fahr. were used in the case of the chrome-molybdenum, chrome-vanadium and chrome steels, while 1475 to 1575 deg. Fahr. were used with the chrome-nickel steel.

Methods of Testing

To obtain results as nearly accurate commercially as possible, each group of test pieces was quenched from a production furnace in the same manner as small forgings would be handled in receiving similar treatment. The drawing operations were carried on in a laboratory electric furnace so that the effect of the drawing temperature would be defined sharply. The physical properties we obtained, true to our expectations, showed occasional variations which were to our dislike, but were fairly evenly distributed over the four types of steel. In this connection, in nearly all cases, in publishing the physical properties of a given steel there is such an exact uniformity of the superiority of one steel over another, or such an exact uniformity in the variations of the elastic limit and ultimate strength with respect to the elongation and reduction of area under different treatments, that it is apt to throw an element of doubt into the mind of one who can appreciate the very peculiar and pronounced variations that do exist under the most accurate handling of test pieces. The ultimate findings of the tests given herewith, however, were derived from a very broad average of results including good and bad, which we must admit is the proper way to form conclusions on a problem of this kind. The chemical analyses of the various types of steel tested are shown in Table 1.

Table 1—Chemical Analysis of Various Types of Steels Tested

	Chrome-Molybdenum, Per Cent	Chrome-Vanadium, Per Cent	Chromium, Per Cent	Chrome-Nickel, Per Cent
Carbon	0.260	0.320	0.310	0.280
Manganese	0.570	0.750	0.850	0.720
Sulphur	0.020	0.033	0.012	0.012
Phosphorus	0.025	0.025	0.020	0.020
Chromium	0.800	1.030	0.910	0.580
Molybdenum	0.360	....	....	....
Vanadium	....	0.160	....	....
Nickel	....	....	....	1.270

Quenching and Drawing Temperatures

As has been stated, three quenching temperatures were used for each type of steel for each size, except for the 2-in. square as noted. Also, three drawing temperatures were used for each quench for each size, 1000, 1100 and 1200 deg. Fahr.; that is, nine pieces of ⅞-in. round stock were quenched from a given quenching temperature and three were drawn at 1000 deg., three at 1100 deg., three at 1200 deg. Fahr., and so on through the series. The results obtained, as shown by averages, are given in Tables 2, 3, 4 and 5.

Table 2—Results of Tests of ⅞-In. Round Steels

Grade of Steel	Quenching Temperature	Drawing, Deg. Fahr.	Yield Point as Elastic Limit, Lb. per Sq. In.	Ultimate Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent	Number of Tests Made	Merit Index
Chrome-molybdenum	1,550 to 1,650	1,000	146,850	158,530	21.2	55.6	9	72.8
Chrome-vanadium	1,550 to 1,650	1,000	148,900	157,770	19.4	54.6	9	65.5
Chrome	1,550 to 1,650	1,000	124,637	140,124	16.9	58.1	9	53.4
Chrome-nickel	1,475 to 1,575	1,000	119,861	135,164	18.5	59.5	9	58.2
Chrome-molybdenum	1,550 to 1,650	1,100	122,733	136,966	22.5	60.7	9	74.3
Chrome-vanadium	1,550 to 1,650	1,100	127,570	140,030	22.7	57.5	9	71.5
Chrome	1,550 to 1,650	1,100	104,911	121,108	20.5	64.0	9	64.3
Chrome-nickel	1,475 to 1,575	1,100	107,266	122,888	20.5	62.8	9	63.4
Chrome-molybdenum	1,550 to 1,650	1,200	100,980	118,900	26.5	68.4	9	92.2
Chrome-vanadium	1,550 to 1,650	1,200	119,000	131,983	23.6	60.6	9	75.2
Chrome	1,550 to 1,650	1,200	97,111	113,699	21.7	64.8	9	65.0
Chrome-nickel	1,475 to 1,575	1,200	94,804	111,800	21.7	65.0	9	64.0

To obtain results as nearly accurate commercially as possible, each group of test pieces was quenched from a production furnace in the same manner as small forgings would be handled in receiving similar treatment. The drawing operations were carried on in a laboratory electric furnace so that the effect of the drawing temperature would be defined sharply. The physical properties we obtained, true to our expectations, showed occasional variations which were to our dislike, but were fairly evenly distributed over the four types of steel. In this connection, in nearly all cases, in publishing the physical properties of a given steel there is such an exact uniformity of the superiority of one steel over another, or such an exact uniformity in the variations of the elastic limit and ultimate strength with respect to the elongation and reduction of area under different treatments, that it is apt to throw an element of doubt into the mind of one who can appreciate the very peculiar and pronounced variations that do exist under the most accurate handling of test pieces. The ultimate findings of the tests given herewith, however, were derived from a very broad average of results including good and bad, which we must admit is the proper way to form conclusions on a problem of this kind. The chemical analyses of the various types of steel tested are shown in Table 1.

Quenching and Drawing Temperatures

As has been stated, three quenching temperatures were used for each type of steel for each size, except for the 2-in. square as noted. Also, three drawing temperatures were used for each quench for each size, 1000, 1100 and 1200 deg. Fahr.; that is, nine pieces of ⅞-in. round stock were quenched from a given quenching temperature and three were drawn at 1000 deg., three at 1100 deg., three at 1200 deg. Fahr., and so on through the series. The results obtained, as shown by averages, are given in Tables 2, 3, 4 and 5.

Generally speaking, in performing tests of the above nature where we desire to note a comparison of the physical properties of certain steels in terms of the elastic limit, ultimate strength, reduction of area and percentage of elongation, sometimes we are confused because of the variations we obtain, and because it is practically impossible, over a large number of test pieces, to hold any one or two factors constant so as to note the variation in the remaining factors. If we could heat-treat the test pieces so that the elastic limit would be the same in all, the variation in the other three remaining factors would tell the story.

The Merit Index for Comparison

After having made hundreds of tests, the question then presents itself as to how best to interpret the results obtained. Without entering into any discussion on this point, I take the liberty of using the merit index suggested by H. T. Chandler, and presented in a paper by John D. Cutter[3], and of expressing the results obtained above in terms of the equation

$$(I = C\tfrac{1}{2}\, e\, (E + S) \div (100 - R)$$

where

I = the merit index
e = the percentage of elongation in 2 in.
E = the elastic limit in terms of 1000 lb. per sq. in.; in the tests it is taken as the yield point
R = the percentage of reduction in area
S = the ultimate strength in terms of 1000 lb. per sq. in.

The results are noted in Tables 2, 3, 4 and 5, while a general average is shown by the curves in Figs. 1 and 2. The above data or tests have indicated to us that

Table 3—Results of Tests of 1-In. Round Steels

Grade of Steel	Quenching Temperature	Drawing, Deg. Fahr.	Yield Point as Elastic Limit, Lb. per Sq. In.	Ultimate Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent	Number of Tests Made	Merit Index
Chrome-molybdenum	1,550 to 1,650	1,000	153,880	162,200	19.4	55.9	9	69.7
Chrome-vanadium	1,550 to 1,650	1,000	147,750	158,770	19.8	54.8	9	67.2
Chrome	1,550 to 1,650	1,000	124,872	138,066	17.0	57.9	9	53.1
Chrome-nickel	1,475 to 1,575	1,000	120,860	136,086	18.1	59.9	9	58.0
Chrome-molybdenum	1,550 to 1,650	1,100	112,400	129,000	24.7	64.7	9	84.6
Chrome-vanadium	1,550 to 1,650	1,100	127,100	139,300	23.4	58.3	9	74.8
Chrome	1,550 to 1,650	1,100	99,706	116,526	20.6	63.8	9	61.5
Chrome-nickel	1,475 to 1,575	1,100	103,740	121,330	21.1	63.6	9	65.2
Chrome-molybdenum	1,550 to 1,650	1,200	99,330	117,400	27.1	66.7	9	88.3
Chrome-vanadium	1,550 to 1,650	1,200	101,950	116,500	26.9	64.8	9	83.4
Chrome	1,550 to 1,650	1,200	96,390	112,766	21.9	66.2	9	67.7
Chrome-nickel	1,475 to 1,575	1,200	92,590	111,013	22.1	65.5	9	65.2

[3] See *Transactions of the American Society for Steel Treating*, vol. 1, p. 188.

chrome-molybdenum steel for heat-treated automobile parts has considerable merit. In view of the fact that this steel apparently can be produced in unlimited quantities with no danger of shortage of molybdenum, and because it has been produced and sold at a lower price than its closest competitor, chrome-vanadium steel, its adoption has been sanctioned.

Forges Easily and Scales Readily

With reference to its action through various stages of production, I would say that it forges entirely satisfactorily, with the particular advantage that the scale formed breaks away from the forgings very easily. With proper composition and for sizes within ordinary limits, it cold shears as readily as the other grades of commercial alloy steels. It responds very readily to the heat-treating operations, the percentage of forgings falling outside of the required Brinell hardnesses being very small.

As to its machining qualities, no figures can be given to corroborate the claims that have been made with regard to the reduction of tool costs and the like. However, we have satisfied ourselves by noting the machinability of the tonnage that has passed through our shops that chrome-molybdenum steel machines at least as well as the best there is. We have not heard of a failure of any part made of this steel out of the 50,000 cars that have thus far been produced since its adoption.

Case-Hardening Grades

Very few if any data have been recorded regarding the case-hardening grades, especially from the viewpoint of the consumer. Our first attention was to note whether any of the various grades of the low carbon steels could be applied to case-hardened gears, knuckle pins and shafts. The Studebaker Corporation is a large user of case-hardened gears and must demand the best commercial grade of steel for the purpose.

The chemical composition of the first heat experimented with showed carbon 0.130, manganese 0.400, sulphur 0.025, phosphorus 0.016, chromium 0.610 and molybdenum 0.350 per cent. This analysis was abandoned for the reason that such high temperatures were required for double heat treatment as would prove commercially impracticable. Quenching directly from the carbonizing box and using a single lower heat for hardening did not produce the desired results as regards core fracture.

The next step consisted in obtaining a higher carbon steel to lower the quenching temperatures required and to find, if possible, a steel that would give the desired results by a single quenching temperature after carbonizing. The chemical composition of the heats obtained ran very consistently as follows: Carbon 0.190, manganese 0.540, sulphur 0.010, phosphorus 0.025, chromium 0.700 and molybdenum 0.370 per cent.

The first tests made on the above analysis apparently warranted an extensive trial of this grade and, as a result, steel for 5000 cars was ordered. Upon getting into production with this material, with which all transmission parts and rear axle gears and drive pinions were produced, certain peculiarities were noted that ordinarily could not be observed with a few trial test pieces, the principal one perhaps being the fact that a satisfactory core fracture could not be obtained regularly; that is, after subjection to shock, the fracture would not show what is commonly called toughness but have a crystalline or granular appearance. This condition is particularly objectionable in parts that are subjected to a straightening operation and in clash gears.

A further investigation proved that to obtain much better results, the part to be heat treated had to be subjected to prolonged heating above the critical temperature of the core to bring about the proper condition before quenching and the lower heat for hardening had to be applied as quickly as possible to prevent the core from being subjected to lengthy heating at the lower temperature. This can be expressed more practically by stating that a certain gear, when heated for exactly 3 min. in a lead pot at 1425 deg. Fahr. and then quenched in oil was a fairly satisfactory product; but, if held 4 min. or more in the lead pot at the same temperature, it became very brittle. This prolonged heating necessary above the critical temperature indicates, I think, a sluggishness peculiar to chrome-molybdenum steels and may account for the higher drawing temperature permissible in the forging grades.

[The author here discusses the effects of carbonizing and hardening and gives a table of physical tests of steels after case-hardening.]

To obtain the best possible results with the case-hardened parts it was necessary to quench from the carbonizing box into oil and follow this by the regular double heat treatment and a final draw at 375 to 400 deg. Fahr., each operation being carefully timed.

Table 4—Results of Tests of 1½-In. Round Steels

Grade of Steel	Quenching Temperature	Drawing, Deg. Fahr.	Yield Point as Elastic Limit, Lb. per Sq. In.	Ultimate Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent	Number of Tests Made	Merit Index
Chrome-molybdenum	1,550 to 1,650	1,000	147,900	157,600	20.3	57.0	9	72.3
Chrome-vanadium	1,550 to 1,650	1,000	129,800	140,200	20.9	57.6	9	66.6
Chrome	1,550 to 1,650	1,000	101,370	122,178	18.1	60.8	9	51.6
Chrome-nickel	1,475 to 1,575	1,000	103,360	123,036	18.7	61.1	9	54.1
Chrome-molybdenum	1,550 to 1,650	1,100	118,500	131,900	24.0	64.4	9	84.3
Chrome-vanadium	1,550 to 1,650	1,100	117,800	134,900	23.5	61.0	9	76.1
Chrome	1,550 to 1,650	1,100	86,770	109,710	21.9	65.0	9	61.4
Chrome-nickel	1,475 to 1,575	1,100	87,720	110,492	22.3	65.5	9	64.0
Chrome-molybdenum	1,550 to 1,650	1,200	92,900	112,400	26.9	68.8	9	88.7
Chrome-vanadium	1,550 to 1,650	1,200	102,400	118,500	26.5	67.0	9	88.8
Chrome	1,550 to 1,650	1,200	78,250	103,453	23.7	67.2	9	65.6
Chrome-nickel	1,475 to 1,575	1,200	80,417	103,577	24.6	67.8	9	70.3

Table 5—Results of Tests of 2-In. Square Steels

Grade of Steel	Quenching Temperature	Drawing, Deg. Fahr.	Yield Point as Elastic Limit, Lb. per Sq. In.	Ultimate Strength, Lb. per Sq. In.	Elongation in 2 In., Per Cent	Reduction of Area, Per Cent	Number of Tests Made	Merit Index
Chrome-molybdenum	1,550 to 1,600	1,000	108,500	125,400	27.6	62.0	2	85.0
Chrome-vanadium	1,550 to 1,600	1,000	104,400	119,500	24.3	61.5	2	70.3
Chrome	1,550 to 1,600	1,000	94,375	113,050	20.7	61.3	2	56.4
Chrome-nickel	1,475 to 1,575	1,000	96,250	119,690	19.9	62.5	2	57.9
Chrome-molybdenum	1,550 to 1,600	1,100	100,500	117,200	25.4	66.5	2	82.6
Chrome-vanadium	1,550 to 1,600	1,100	112,800	127,800	24.3	59.0	2	71.3
Chrome	1,550 to 1,600	1,100	83,750	105,700	21.8	65.0	2	59.0
Chrome-nickel	1,475 to 1,575	1,100	89,375	111,350	21.8	65.0	2	62.5
Chrome-molybdenum	1,550 to 1,600	1,200	78,800	100,600	29.0	70.0	2	86.7
Chrome-vanadium	1,550 to 1,600	1,200	107,500	123,800	23.4	59.0	2	66.1
Chrome	1,550 to 1,600	1,200	77,875	99,375	24.2	68.5	2	68.1
Chrome-nickel	1,475 to 1,575	1,200	78,750	102,900	25.3	68.7	2	73.4

There are two particular advantages that should be noted, however, in that chrome-molybdenum steel will take on a given case-depth in 10 per cent less time than chrome-nickel steel; also, there will result an average increase in Shore hardness of 5 to 7 points.

Nickel-Molybdenum Steel for Case-Hardening

In spite of the fact that we have not received any complaints with regard to failures of case-hardened parts of chrome-molybdenum steel, and I feel assured we will not in the future, we have seen fit to discontinue this particular grade for this particular purpose. Chrome-nickel steel apparently still holds the first place among commercial steels for case-hardening of important parts, but it is the opinion that nickel-molybdenum steel will be a serious contender. At present we have a heat of approximately 100,000 lb. of nickel-molybdenum steel of the following analysis: Carbon 0.130, manganese 0.380, sulphur 0.022, phosphorus 0.020, nickel 1.580 and molybdenum 0.200 per cent. This material is being made into gears, knuckle pins and the like. It is stated that this steel should prove a serious contender with chrome-nickel steel for case-hardening purposes, because of its ability, in the hot-rolled condition, to harden in oil after carbonizing. This statement may not be wholly clear to some, but it is a fact that a piece of hot-rolled steel of a given composition after carbonizing will not harden in oil to the degree that a piece of the same composition will if first subjected to forging.

The steering-knuckle pin has been one of our problems. This pin is made from ⅞-in round hot-rolled stock and from alloy steel. It is case-hardened and a Shore hardness of 70 is required after final grinding. It always has been necessary to water-harden this piece, irrespective of the type of steel we use and, as a result, there is always a certain percentage of loss due to straightening. To illustrate, in one lot of 1949 nickel-molybdenum pins carbonized and hardened in oil, only 10 fell below 75 above hardness, none was lost in straightening or because of softness after final grinding. This we think is a remarkable record in view of the fact that chrome-nickel, chrome-vanadium, chrome-molybdenum and 3½ per cent nickel steels have all been tried without success.

To summarize this portion of the subject briefly, our observations lead us to believe that, for carbonizing purposes, chrome-molybdenum steels should prove entirely satisfactory for parts in which hardness alone is the chief factor, but should be considered carefully before being used for important parts in which combined toughness and hardness are requisite, such as gears, steering-knuckle pins and the like.

The results thus far obtained with nickel-molybdenum steel are very satisfactory in every way when compared with chrome-nickel steel, with the added advantage of the greater hardness that can be obtained from an alloy steel of the former type.

There are many more details that could be added to the above, but I feel that they might serve to confuse rather than enlighten those desiring a frank statement of conditions pertaining to two important grades of chrome-molybdenum steel. In connection with the oil-hardening and spring steels we are at present in the midst of exhaustive investigation, but are not yet in a position to express an opinion.

Electrically Operated Japanning Oven of New Design

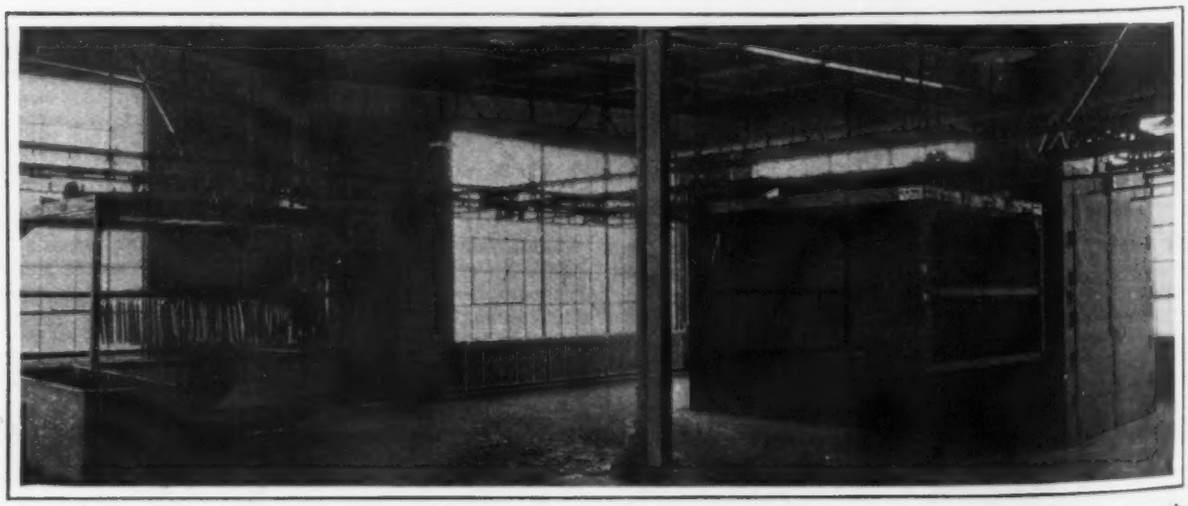
Built on Sectional Bookcase Principle—Details of First Installation—Accessory Equipment

AN electric japanning oven built on the sectional bookcase principle, making it easy to lengthen or shorten and permitting installation of additional adjoining units, has been brought out by the Ohio Body & Blower Co., Cleveland. The sides of the oven are built of sheet-steel panels, 2 ft. wide, that fit into a specially designed joint. The joint seals the panels both on the inside and outside of the oven.

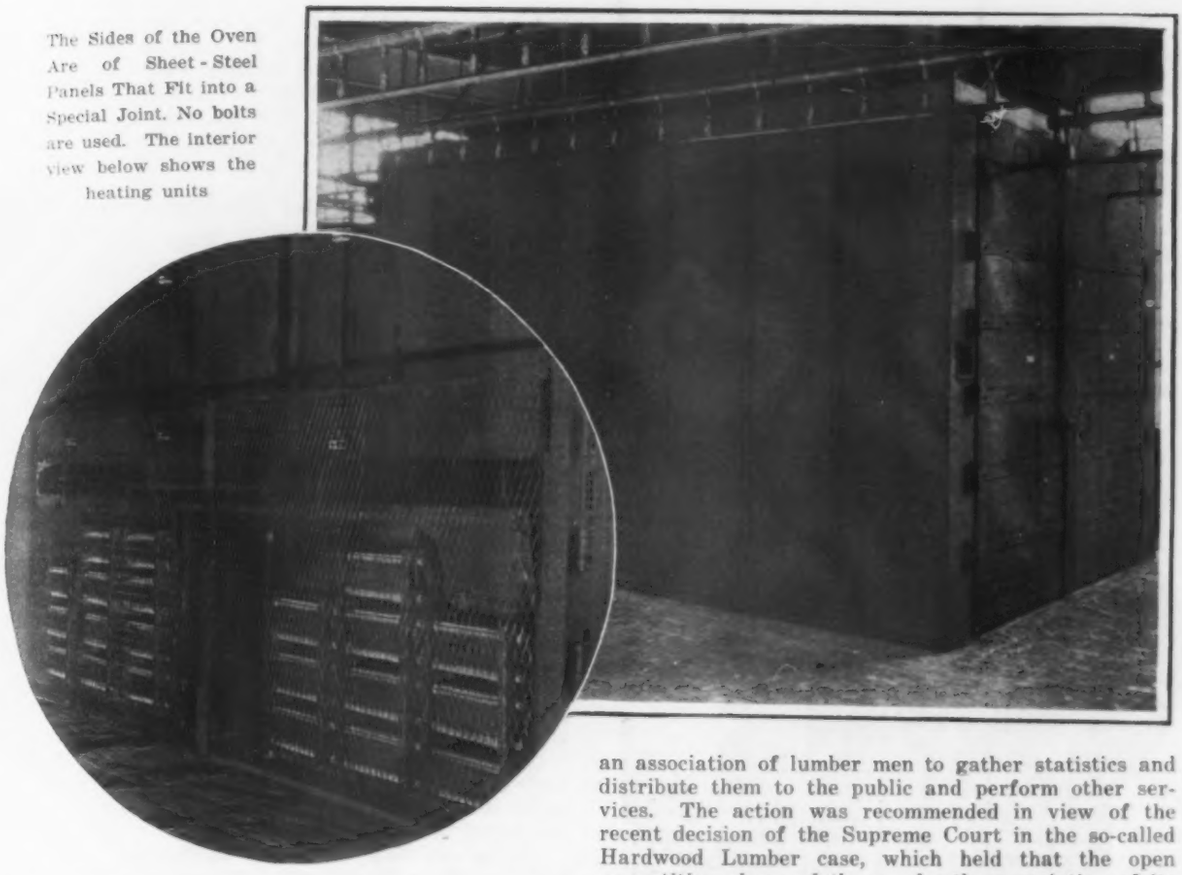
In this design the use of tee iron in joining the sections of the oven, or other supporting members, is eliminated and the use of bolts extending through the side walls, also. The sides of the oven are thus completely insulated. The only structural members are channels at the bottom and light angles at the top to make the structure rigid. The oven is easily assembled, a feature which reduces erecting costs.

The oven is ventilated by a Sirocco blower, direct connected to a motor located on top of the oven. The exhaust outlet is placed in the center of the oven floor, and cold air inlets are provided at the front of the oven on each side of the doors. The cold air passes through the heating units at each side and when heated rises to the top of the oven. The action of the fan in exhausting the air at the bottom provides a constant circulation and uniformity of temperature throughout the oven. A red light shows at the side of the oven when the exhaust system is operating, and should the fan stop, the light goes out. The doors have thrust ball-bearing hinges so that their operation is easy.

The first oven of this design, which is illustrated, has been installed at the new plant of the Lima Sheet Metal Products Co., Lima, Ohio, for use in japanning automobile parts and other sheet metal stampings. The entire equipment in the japanning department was installed by the Ohio Body & Blower Co. An overhead double-track conveying system extends through the



Arrangement of Japanning Department. The dipping tank and carrier are shown at the left, with the drip board beneath the carrier



The Sides of the Oven Are of Sheet-Steel Panels That Fit into a Special Joint. No bolts are used. The interior view below shows the heating units

oven, which has doors at both ends. The conveying equipment was supplied by the Louden Machinery Co., Fairfield, Iowa. The oven is 16 ft. deep, 11 ft. wide and 9 ft. 6 in. high. It has 42 heating units and is of 105 kw. capacity, the electric current being supplied at 220 volts, 3-phase, 60 cycles. The heat is automatically controlled by a Taylor Instrument Co. thermostat providing a range of temperature from 100 to 530 deg. Fahr. Parts are japanned in various colors, some of which require much lower baking temperature than others, and for this reason the wide range in temperature control was provided.

The work is dipped in a portable dipping tank at one end of the japanning room and this has two side wheels and a swivel wheel at one end. After dipping it is hung from a sectional rack that is suspended from the overhead carrier and drips upon a drip board beneath. When fenders or other large parts are being japanned, the lower part of the rack is removed and the parts are suspended from the upper framework. If the parts are small the entire rack is used as shown in the illustration, the work being suspended from the cross members that are inserted as required. The racks are 8 ft. long, 7 ft. wide and 4 ft. 6 in. high. Six racks are used, two being placed in the oven at one time.

The track system is arranged so that the rack does not turn when reaching the right angle turn in the track in front of the oven, but retaining its relative position, passes into the oven sideways. After leaving the oven the rack with its load is pushed along the track to its assembling and shipping department, where there is a return track leading back to the dipping tank.

Tests have shown that from a cold oven the temperature has been brought up to 450 deg. in 1 hr. and 500 deg. in 1 hr. 45 min. A temperature of 350 deg. in an hour is guaranteed. The maximum baking load, including conveyor, is 3500 lb. per hour. The current consumption has been shown by test to be approximately 75 kw. for an hour.

Hardwood Association Reorganizes

The American Hardwood Manufacturers' Association has adopted the recommendation made last week of the board of directors that it disband and organize an association of lumber men to gather statistics and distribute them to the public and perform other services. The action was recommended in view of the recent decision of the Supreme Court in the so-called Hardwood Lumber case, which held that the open competitive plan and the use by the association of its organization to influence prices was illegal. L. C. Boyle, general counsel of the association, in explaining the purpose, said: "It is a new and an original departure from former methods whereby an independent corporation renders service on equal terms to the buyer and the seller." The name of the new organization will be the American Hardwood Institute, and J. E. Starke of Memphis has been appointed to perfect the organization.

Advocates of Metric System Organize

WASHINGTON, March 14.—That proponents of the metric system are going to stimulate efforts looking to the establishment of this plan of measurement, has become evident. An organization of the local section of workers for the installation of the metric system and the passage of the Britten-Ladd bill was effected last Friday night at George Washington University Law School. Officers were elected as follows: President, E. J. Henning, Assistant Secretary of Labor; vice-president, G. F. Weeks, editor of the *Mexican Review;* second vice-president, Dr. H. L. Hodgkins; secretary and treasurer, W. Peters.

The executive committee consists of Dr. Harvey Wiley, chairman; John Barrett, S. J. Macfarren, Dr. C. L. Parsons, and Stephen Kramer, Assistant Superintendent of Schools.

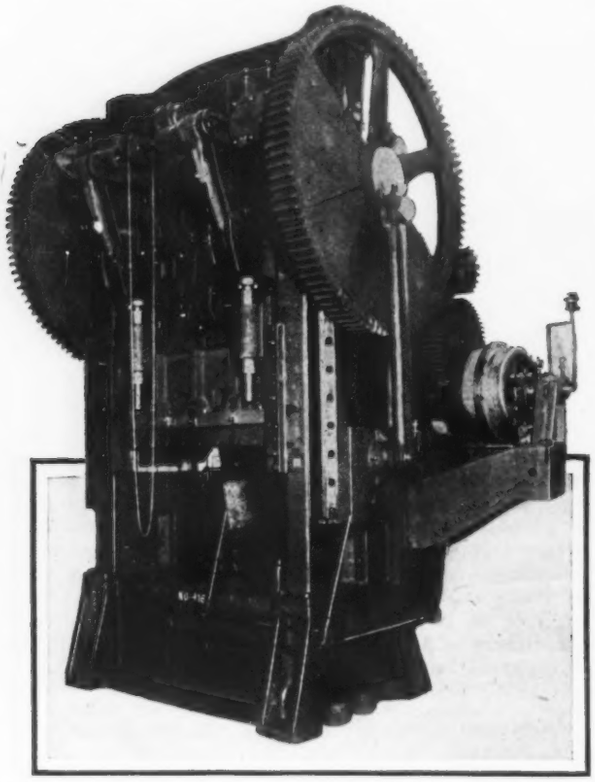
It is also proposed to name an "educational" committee in order to acquaint the people of the country with the alleged benefits that would arise from the metric system. Senator C. F. Ladd, of North Dakota, spoke of an amendment to his bill which would provide that in 1926 all Government specifications and engineering works be done with the use of the metric system.

Owing to the continued high cost of materials entering into industrial plant construction, the Youngstown Steel Co., Youngstown, Ohio, is not likely to proceed this year with its proposed mechanical puddling plant at Warren, Ohio. Several years ago the company acquired a site at Warren and planned to proceed with its plant this year. The mechanical puddler which it will employ is the invention of E. L. Ford of Youngstown.

Large Press for Drawing Axle Housings

Competition between guns and armor plate in the construction of warships seems to be somewhat paralleled in the last few years in the pressed metal industry, between presses and stampings. The large double-crank toggle drawing press shown in the accompanying illustration, built recently for the Crosby Co., Buffalo, by the E. W. Bliss Co., Brooklyn, N. Y., is a typical result of the see-sawing tendency between the expanding requirements of the stamping trade and the equipment needed to keep pace with them.

The press illustrated is for use in drawing pressed-steel axle housings for automobile trucks. These housings, which are intended to replace those of cast iron formerly used, are drawn in two sections and welded together, the material being ⅜-in. steel. The



Power Is Transmitted to the Outside Slide from Both Ends of the Press. This is followed also in connection with the crankshaft which operates the inner slide

press is of tie-rod construction, twin-driven and triple-geared, the ratio of the gearing being 85 to 1. The gears of the entire train are of steel with machine-cut teeth.

Power is transmitted from the main driving gears to the outside slide or blank holder through a series of toggles and a dwell of 120 deg. is obtained. The number of toggles and connections incorporated is the lowest consistent with the most efficient results. To maintain this simple and effective construction and at the same time avoid torsional strain, the power is transmitted to the outside slide from both ends of the press. This is followed also in connection with the crankshaft which operates the inner slide, this being twin driven by means of a driving gear on either end.

The small number of connections or links used in transmitting power to the outer slide is intended to assure the minimum of power consumption, and also to afford simple, compact and strong construction with minimium of wear. The connection pins are hardened and ground, which is intended as a further provision against wear.

The adjustment of the inner slide or plunger is made by a 15-hp. motor mounted on the front of the crown. The machine itself is driven by a 100-hp. motor and controlled by a powerful hand-actuated friction clutch of the double-grip type. The distance from bed to inner slide, stroke down and adjustment up, is 59 in.; and from the bed to the outer slide, 56 in. The stroke of the inner slide is 28 in.; that of the outer slide, 20 in. The area of the bed is 60 x 116 in.; the area of face of blankholder, 60 x 102 in., and area of face of plunger, 36 x 86 in. The weight of the press is 600,000 lb. (300 ton).

Wages of Sheet and Tin Plate Workers

YOUNGSTOWN, March 14.— Wage rate of sheet workers in mills operating under the sliding scale of the Amalgamated Association of Iron, Steel and Tin Workers will continue at 26 per cent above base for the March-April period, as result of the bi-monthly examination of sales sheets March 11 at Youngstown. The examination disclosed an average price of 2.80c. per lb. on Nos. 26, 27 and 28 gage black sheets shipped by mid-Western mills during the 60-day period ending Feb. 28. This same average was revealed at the settlement two months before and the wage rate is therefore unchanged. It compares with a peak of 5.80c., the average price developed on September-October, 1920, shipments of sheet steel.

Tinplate, however, declined from $4.80, the average disclosed two months ago, to $4.75 per base box, and affected workers will therefore sustain a reduction of one per cent of the base rate, or an actual working cut of two-thirds of one per cent from the rate paid in January and February. Under the new rate, workers in the tin plate division of the industry will be paid 18½ per cent above base.

Whereas sheets show a firmer tendency, the current tin plate market is $4.60, and employees in tin mills are therefore due for another reduction at the settlement in June.

James H. Nutt, secretary of the Western Sheet and Tin Plate Manufacturers' Association, acted for the employers, as usual, while M. F. Tighe of Pittsburgh, president of the Amalgamated Association, represented the interests of employees.

Tool Builders' Standardization Committee

The National Machine Tool Builders' Association has appointed the following members to act as a general committee on standardization in co-operation with a similar committee of the American Society of Mechanical Engineers:

Automatic Screw Machines: E. C. Henn, National Acme Co., chairman; R. S. Brown, New Britain Machine Co.; E. E. Blundell, Cleveland Automatic Machine Co.

Shapers: R. T. Hazelton, Cincinnati Shaper Co., chairman; C. L. Cameron, Gould & Eberhardt; J. M. Mills, Smith & Mills.

Grinders: A. C. Hoefinghoff, Cincinnati Grinder Co., chairman; Winslow Blanchard, Blanchard Machine Co.; James N. Heald, Heald Machine Co.

Planers: George Langen, Cincinnati Planer Co., chairman; C. C. Swift, Ohio Machine Tool Co.; E. M. Woodward, Sr., Woodward & Powell Planer Co.

Milling Machines: Charles S. Gingrich, Cincinnati Milling Machine Co., chairman; E. J. Kearney, Kearney & Trecker Co.; B. P. Graves, Brown & Sharpe Mfg. Co.

Drilling Machines (radial and upright): Arthur C. Pletz, Morris Machine Tool Co., chairman; E. A. Herrcke, Hoefer Mfg. Co.; Reed, Prentice Co., Worcester, Mass.

Turret Lathes: R. F. Flanders, Jones & Lamson, chairman; Oskar Kylin, Foster Machine Co.; Charles Meier, Acme Machine Tool Co.

Policy as to Open Price Associations

WASHINGTON, March 14. — Misunderstanding appearing to have arisen over the recent correspondence between Secretary of Commerce Hoover and Attorney General Daugherty regarding the particular character of trade associations with which the Department of Commerce could rightly continue to co-operate in statistical and other matters of commercial advancement, Mr. Hoover last week issued a statement saying that the department makes no interpretation of the Sherman law. It does have to decide in what sort of association work it can rightly co-operate, Mr. Hoover said, but the department does not find a basis of co-operation with the so-called open price association, and never has.

Labor and Its Legal and Moral Status*

Development of American Labor Policies in 35 Years—Collective Responsibility Must Accompany Collective Activity

BY WALTER GORDON MERRITT

WE are the only nation which has what is known as labor litigation, because we are the only nation which recognizes that industrial rights are entitled to enforcement, as against the activities of combinations, in the civil courts of our land, on the application of a private party seeking protection.

To understand the full significance of this situation, I want to call your attention to the policy of government toward business and capital. The first great restrictive regulation was the passage of the Interstate Commerce act in 1887, to meet evils caused by unfair rebates as between different classes of shippers. We laid down the law then and there that railroads must serve everybody with impartiality, and upon the same terms and the same basis.

In 1890 we passed the Sherman anti-trust law, which, in effect, was designed for the protection of the public and to keep open the channels of interstate trade and commerce, so that the commodities of any producer could flow into the markets without obstruction, and the consumers could purchase them as they saw fit.

Then in 1914 we passed the Federal Trade Commission act, which declares that any unfair methods of competition are illegal. In other words, we have practically bridged the chasm between law and morals by declaring that, if any competitor attempted unfair competition toward another competitor in the course of interstate trade, his practices would be condemned by the Federal Trade Commission, and an injunction could be issued to restrain those practices. Then we passed the Federal Reserve act, designed to protect any interference with competitors through unfair methods in extending credit and financial aid to the respective concerns engaged in business.

So we have erected a great structure designed for the protection of the individual liberty of every business man and every corporation engaged in business, designed to keep open the doors of trade, the doors of opportunity, so that any person may go into business without being confronted with an artificial obstruction.

Some of us think that those laws have gone too far in the manner in which they have been interpreted by the courts, but we must protect the liberty of people to engage in business, and so far as these laws are designed to do that, they are laws which all should support. Sometimes the real test as to the value of a law is as to what that law has avoided, rather than what that law undid. In other words, what would big business do in the absence of any restrictive laws of this kind—not what these laws have done to change conditions as they found them existing.

How All This Affects Labor

Now, coming to the labor situation, which is the point of our particular discussion, I want to take up the application of those laws to labor organizations, to show the extent to which this country has at last become committed to the policy of industrial liberty, as against the policy of conscripting men to join organizations, or conscripting business men to operate solely on a closed shop basis.

In 1893 we had a strike in Chicago, carried on by the American Railway Union, against the hauling of Pullman cars by the railroads, because the Pullman cars were then so-called "scab" cars. In other words, we went through a strike tending to coerce the railroads to discriminate against a certain class of article, which discrimination, under the Interstate Commerce act, was declared to be unlawful. That policy has been repeated frequently, in more or less different forms, since that time.

In the summer of 1920 there was considerable disturbance in New York, caused by the Transportation Trades Council, composed of all the truckmen, of all the men engaged in handling materials at steamship lines, the men who absolutely had control of the products as they came through and out of the port of New York. That organization declared that any merchandise which had been made in open shops should not be handled by them. In other words, open shop merchandise should not pass through the port of New York.

That organization laid down the rule, through its 'longshoremen branches, that no merchandise should be received or transported by any steamship company, which was delivered by non-union workmen; and so, through a citizens' committee, organized out of the big civic organizations in New York, we had to maintain a trucking system of our own, in order to do the work which the union truckmen in New York refused to do, and what was the result? As we carted the materials down to the steamship lines, the steamship employees said, "No, we won't allow the steamship companies to transport materials which have been handled by non-union workmen," and they threatened the steamship companies with a strike, if those materials were taken and served by these public carriers.

We had again a repetition of the Debs case there. We had again a violation of that same principle which was supposed to have been taken care of by the Interstate Commerce act. So it became necessary to go into our State and Federal courts for injunctions, which were secured against the employees and against the steamship companies themselves—in effect, ordering them to serve the public with impartiality, regardless of whether the goods they were called on to carry had touched the hands of a non-union man or not.

Any other principle is going to leave us all in the slough of despond. It would mean that a street railroad company, which attempted to haul a non-union man, might suffer a strike; it would mean that the telephone service might be cut off from a non-union worker, because it was threatened with a strike; it would mean that baggage transportation of all kinds, in the nature of public service, should be denied to people and to property disapproved by the employees of the particular companies who were under public duty to transport those materials. That question has been fairly well cleared up in this quarter of a century.

Labor and the Sherman Law

The Sherman anti-trust law came to the test, as to whether or not it was applicable to organizations of labor as well as to organizations of capital. The primary purpose of that law was to give the public an opportunity of being served by anybody who wanted to serve it, to give the public the right of commercial suffrage in purchasing any line of articles which anybody wanted to put on the market, as against obstructive combinations which might prevent those commodities from getting into the public market, where people could purchase them as they saw fit.

In 1920, at the time the American Federation of Labor was engaged in a policy of carrying on boycotts throughout the country, the members had evolved a scheme for the purpose of promoting their organization, whereby certain concerns, which they singled out for attention, would not be allowed to distribute their goods, because of boycotts being conducted against

*Abstract of paper read Feb. 13 before Pittsburgh convention of American Boiler Manufacturers' Association.

wholesale or retail merchants who dared to purchase those goods. The question arose, "Does that violate the Sherman anti-trust law?"

Litigation has finally settled, in the United States Supreme Court, that combinations of labor to obstruct the channels of interstate trade, and to deny consumers benefits to which they were entitled through free competition, were as much in violation of the Sherman anti-trust law as were capital obstructions; so we strengthened the foundations of our jurisprudence, designed for the protection of the freedom of trade and commerce, as against combinations of labor or capital, throughout the United States.

Labor's Anti-Injunction Movement

In 1914, the first State, I believe, to pass an anti-injunction law was Massachusetts, the good old conservative champion of individual rights. The purpose of this and similar laws was to declare that the workingman's right to work was not a property right. The courts have always declared that the right to work, which is the means by which the workman acquires property, is as much a property right as the money with which he fills his purse. Now labor had run into this difficulty:

In attempting to promote their organizations, their men would go into the courts and get injunctions protecting the freedom of men to work, and protecting the freedom of men to carry on business as they saw fit, and the result was that this policy of conscripting men to join labor organizations had been much retarded. So the only theory to be advanced was to strip the courts of this power to protect these rights, to strip the unorganized workman and leave him naked and defenseless against this combined, economic power; to do as Herbert Crowley said in his book, "Abandon the non-union workman in the way in which he has been abandoned in Great Britain."

When this law was passed in Massachusetts, one of those strange things happened, which is the very irony of fate. At that time there was trouble between the I. W. W. and the hod-carriers' union of the American Federation of Labor. The I. W. W. men were being driven off buildings because of strikes threatened by the American Federation of Labor, which demanded that only its men be employed, and that members of the I. W. W. be not employed. So the I. W. W. went into court and said, "We want an injunction against the hod-carriers' union, to protect us in our right to work."

That case went on up, and the Supreme Court of Massachusetts had to pass upon the validity of that law. It said, "If before the law these people would be entitled to an injunction, does this law deny them the right to an injunction? Oftentimes it appears that the workingman's right to work is his sole property right. Now, is it fair class legislation that he should be put upon a lower plane of protection, in reference to his sole property right, than are other people in connection with their property rights? As it is not fair, the law is unconstitutional and void, and the I. W. W. should receive their injunction against the hod-carriers' union of the American Federation of Labor."

This is history of tremendous importance.

How the British Situation Differs

Now, we are up against the fundamental proposition as to whether our present policy will be continued. In Great Britain the opposite policy prevails. Every labor organization there is beyond the reach of civil process. A labor leader can go out and libel your wife, can maim one of your employees, or can dynamite your factories, and you cannot hold the labor union responsible for what that man did in behalf of the labor union. You cannot bring the labor union into the civil courts and get private protection, and the result is that you can get no protection whatsoever. The labor organizations are privileged institutions; they are what I call outlaws, because they are beyond the reach of law.

In Great Britain the railroad employees may strike against hauling coal produced by non-union workmen, or imported from foreign countries. Society has no rights as against that sort of thing. There is no limitation upon the use of the economic power of a labor union in Great Britain under the law, because they are entirely freed from any restriction of that kind. We probably could not pass such laws in this country, because we are a country of limited powers, by virtue of the restrictions of our constitution; but in Great Britain you can pass a law saying that red-haired men shall be employed and that bald-headed men shall not, and it would be a valid law, because it is unlimited in its powers.

Where collective action tends to deprive a man of the freedom of his own decision, of his right to carve out his own destiny, collective action has gone too far. Where collective action means that men voluntarily gather together to accomplish in a group what they cannot accomplish individually, then collective action is on the right track. Whatever virtues there are in collective self-help, it must be remembered that the pillar stones of this nation are individual initiative, individual character and individual enterprise. So, as I have often said, I don't believe any man should be obliged to sell his birthright to any class for a mess of pottage. I believe the right to remain unorganized is just as sacred as the right to organize, and I believe that any institution that grows by force rather than service, which is seeking to conscript people into the organization and hold them there by artificial authority, which lifts the institution above all ordinary laws of reward and punishment, is an institution which will become in the end a public bane and not a public benefit.

Ironton Fire Brick Co.'s New Plant

The Ironton Fire Brick Co., Ironton, Ohio, has just recently increased its capital to enable it to make extensive improvements at the plant at Ironton and also develop a large acreage of newly acquired fire clay land in Carter county, Ky., in the heart of the famous Olive Hill fire clay region. The building of two new 32-ft. inside diameter, round, down-draft, double-bottom kilns, a new steam heated concrete drying floor and the complete rebuilding of the ground clay storage bins, elevators, etc., together with the installation of a measuring device which enables the company to measure positively and accurately any desired mixture of clays, gives it a plant at Ironton modern in every particular.

A 1500-ft. double track railroad switch has been built at Bradmyer, Carter county, Ky., on the Lexington division of the Chesapeake & Ohio Railway, from which point the company is now shipping clay to the plant at Ironton. A 2800-ft. tramway connects the clay tipple at the switch with the mine, and one man, single handed, can deliver any number of cars loaded with clay from the mine to the tipple by gravity.

There are 712 acres of clay land, which has been estimated to furnish enough clay to last 100 years, manufacturing at the rate of 100,000 brick per day. The clay deposit is exceptionally fine—a recent analysis showing a fusion point of 3254 deg. Fahr., and analyzing:

Silica	51.97	Lime	0.60
Alumina	45.07	Magnesia	0.46
Ferric oxide	1.57	Alkalies	0.61

Plans are now being laid for the erection of a modern brick plant at the mines in Kentucky, where a plant site has already been provided. E. F. Myers is president and general manager.

New British Steel Announced

As the result of research work carried out by H. H. Ashdown and others at their Openshaw works at Manchester, Armstrong, Whitworth & Co. have produced a steel, known as Vibrac. What is claimed for the new steel is that in addition to responding satisfactorily to even higher mechanical requirements, particularly in respect to elastic limit, than those obtained from nickel-chrome steels, it may, subject to any normal treatment, after tempering, be either furnace cooled or cooled in air, thus cutting out risks of distortion, and yet will give higher impact values than nickel-chrome steel treated under the most favorable conditions.

Blind Efficiently Operate Machine Tools

Siemens-Schuckert Works in Berlin Conduct Series of Experiments to Determine Proper Training Methods

BY HUBERT HERMANNS

OVER 150 of Germany's 3122 war blind have been trained by the Siemens-Schuckert Works, Berlin, Germany, to be self-supporting machine tool operators.

Experiments were first started in 1916 with men who were almost totally blind. They were first placed among the able-bodied on work of either a manual nature or as helpers, but the results were unsatisfactory, as the production was inadequate even under strict supervision. Separating the blind from the other workers was then tried, but this also proved unsatisfactory. Successful results were finally obtained when they were put to work operating machine tools, as in this capacity they developed an efficiency greater than that of women workers with unimpaired vision. The results were sufficiently satisfactory to enable them to attain an earning capacity that permitted of self-support entirely by their own efforts in various manufacturing departments.

The married blind are housed as near as possible to the works to reduce the dangers and inconveniences of traveling, while the single workers are provided for in a home suitably appointed and equipped for their welfare.

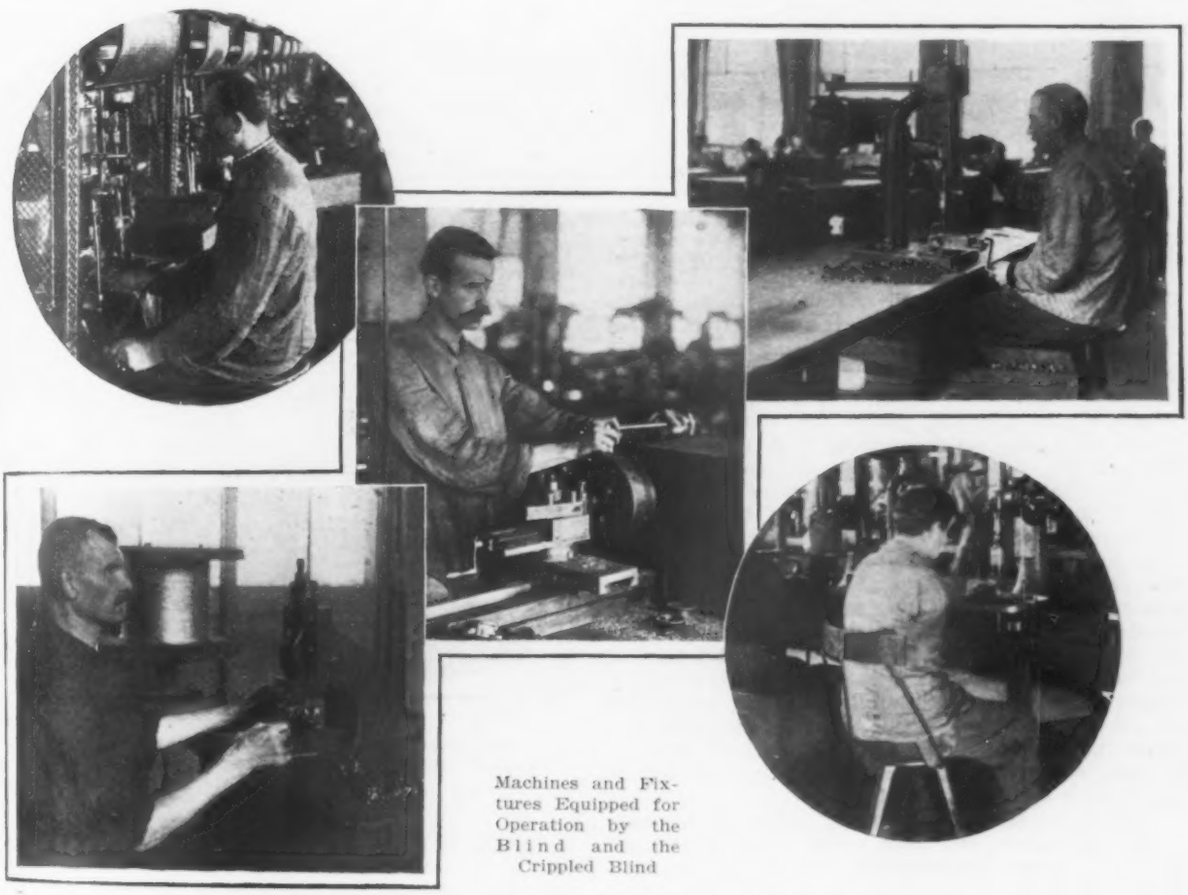
The center picture of the accompanying group shows a blind man performing turning work on a guarded lathe fitted with various gages and safety chucks.

The upper left-hand cut shows how a punch press and similar types of machines are equipped so that they may be operated only when both hands are upon the safety handles. Moving parts generally are inclosed.

The lower left view is that of a blind man using pillar shears. These are guarded between the knife and table to prevent injury to the hands.

The upper right picture covers the operation of drilling and sinking holes used for metal parts. In sinking, the work is held in a suitable chuck and the drill is depressed until it comes in contact with a stop. In drilling, the piece is introduced into a gage having an abutment and the drill is depressed until the stop is reached.

The lower right-hand picture shows the use of a bench drill. This may be operated by a treadle by means of wire rope, the operator being without the right arm.



Machines and Fixtures Equipped for Operation by the Blind and the Crippled Blind

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The principal condition upon which the proposed location of the plant at Hammond, Ind., by the Jones & Laughlin Steel Co., was contingent, has been complied with as the result of the passage of a bill in Congress, providing for the improvement of the west branch of the Indiana Harbor ship canal. The bill now goes to the President for his signature.

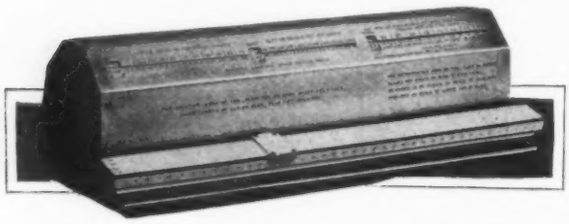
The Saucon plant of the Bethlehem Steel Co., Bethlehem, Pa., has resumed operations after an idleness of several weeks. Enough orders are on hand to maintain operations at least for one month.

Simplex Machine Time Calculator

This calculator, to be used in computing time required for machine tool operations, has been brought out by the Simplex Calculator Co., Box 184, York, Pa., and patents are pending. The device is designed to cover the general machine tool field, being applicable to rotating or reciprocating work or tools. It consists of a cylinder within an aluminum case, and a slide rule of special design attached to an extension of the base.

For use in connection with rotating work for tools, such as lathe, boring mill, drill press or milling operations, the cylinder carries tables indicating r.p.m. for diameters of ¼ in. to 10 ft. at all ordinary cutting speeds. The range of speeds shows above the slot at left.

The number of r.p.m. of a given piece of work is read in the slot opposite the diameter, directly under



Constants Shown on the Rotating Cylinder Are Used on the Slide Rule to Compute Rates

the cutting speed selected. This number is transferred to the rule, which bears four scales, indexed successively: feed, r.p.m., length and time. Locating this number on the r.p.m. scale of the slide, it is moved directly under the number representing the feeds per inch on the feed scale. The indicator is then moved along the length scale to the number representing the length of cut. Directly under this number, on the fourth scale, the result or time in minutes is read. Thus, all the operations necessary to complete a problem for rotating work or tools, requires but one setting of the cylinder, one movement of the slide, and one movement of the indicator on the rule.

In connection with planer, shaper, slotter or any other reciprocating tool, the procedure is similar. The area planed per minute at various forward and return speeds and feeds are read on the cylinder through the slot on right hand end of case. After determining the total area of surface to be planed, by multiplying length by width, either mentally or by the use of the rule, it remains only to divide this number by the area planed per minute. With one setting of the slide in the rule, the quotient or time required is read on the fourth scale under the end of slide.

This instrument was designed primarily for rate setters, estimaters, and those whose duties require the daily or frequent predetermination of time for machine operations. It is a convenient desk size, being about 16 in. long and about 3 lb. in weight. With its use pencil calculations are entirely eliminated, computing time greatly reduced, and chance for errors minimized. The simplicity of its operation enables its use by anyone familiar with the practical side of machine tool operations.

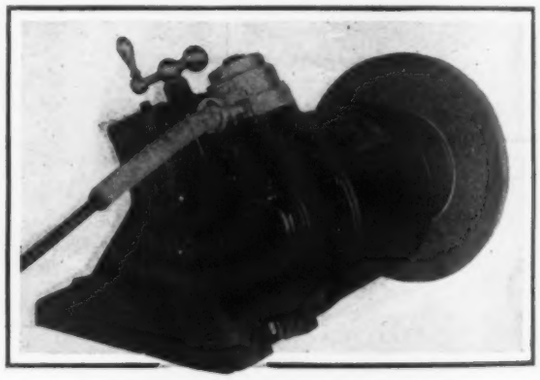
Railroad Wage Reductions Sought

A hearing on general railroad wage reductions was opened before the United States Railroad Labor Board at Chicago on March 7. The wage controversies embraced in the hearing involve 205 railroads and 25 unions. The wages of the various crafts will be considered in the following order: shop crafts, maintenance of way employees, clerks, signalmen, dispatchers, firemen and oilers, and telegraphers. J. W. Higgins, executive secretary Association of Western Railroads, gave testimony on behalf of 101 Western railroads in support of wage reductions for shop men ranging from 4c. to 27c. per hour. For employees paid on a monthly basis, decreases ranging from $10.02 to $14.28 a month have been requested. For track and common laborers, laborers in the maintenance of way department, laborers around shops, station and platform employees and common laborers in station forces now receiving wages in cents an hour, authority has been asked to pay the prevailing rates for similar work in the territory employed. For inexperienced clerks, reductions ranging from $7.50 to $17.50 per month are asked. Mr. Higgins contended that the railroads should not be forced to pay higher rates of wages than are paid in outside industries for similar work. He asserted that the roads are not asking for the low level of pre-war wages. On the contrary, for most classes of employees the proposed scales are 50 to 100 per cent higher than those paid in 1915.

Parallel or Angle Plate Grinder

The Van Dorn Electric Tool Co., Cleveland, has brought out a 12-in. parallel or angle plate grinder for mounting on large lathes in grinding shafts and large rolls. It may be attached also to the vise of a milling machine, the head of a planer, shaper or boring machine for cylindrical or surface grinding. Grinding tools of this type are being made with a vertical supporting plate, but it is claimed that with the use of a 30 deg. angle plate the tool is more rigid, there is less overhang and the adjustments are more accessible, adding to the convenience in operation.

The tool has a 12 by 1½ in. grinding wheel mounted on a shaft 1 in. in diameter at the grinding wheel end. The minimum distance from the angle-plate bolt, extending through a slot in the plate, to the center of



Used on Large Lathes in Grinding Shafts and Rolls. Can be used also on milling machine, planer, shaper and boring machine

the spindle is 8 in., and the shortest distance from the face of the wheel to this bolt is therefore 14 in. To determine whether the tool can be used on a given lathe and the maximum diameter of work in that lathe, the cross feed and compound rest are moved to their extreme outward positions and the distance from the center of the tool post to the center of the spindle is measured. This distance should exceed 14 in. and the excess over the distance represents the maximum radius of the work.

The machine is 19 in. overall, the overhang of the wheel from the center of the angle plate is 10½ in., the diameter of the motor housing 8½ in. and the maximum height of the wheel spindle above the rest is 9½ in. The driving motor has a normal capacity of 1 1/3 hp. with a maximum momentary overload of 2½ hp. The alternating-current stator and direct-current field assembly are interchangeable in the same frame and easily removed. The speed is 1800 r.p.m. Ball bearings are used throughout, these being mounted in dust proof housings. At the grinding-wheel end a double row of ball bearings take both the thrust and radial loads. Forced ventilation is provided by centrifugal fans. The weight is 175 lb. net.

Arguments on Railroad Rate Reductions

Attorneys for Carriers and Shippers Address Interstate Commerce Commission at Conclusion of Hearings —Doubt as to Decision

BY L. W. MOFFETT

WASHINGTON, March 14.—Pleas that no general rate reductions in railroads should be made at this time were strongly presented before the Interstate Commerce Commission by attorneys for the carriers in arguments in connection with the rate investigation case which finally came to a close yesterday after the time for closing the proceeding had again been extended. Counsel for shippers, who, for the most part, urged contrary pleas, insisted that industry cannot be revived until freight rates are reduced. There were some attorneys for shippers, however, who either did not ask for rate reductions or cautioned against any serious cuts that might endanger the revenues of the carriers, but took occasion to ask that if there were any cuts made the particular interests for which they appeared should be permitted to share in the reduced rates.

Among those urging cuts were representatives for the iron and steel, coal, and lumber industries, to mention some of the basic lines seeking lower railroad rates. It was evident throughout the hearings and arguments that the commission does not propose to precipitate any action in the way of general cuts in rates that it feels might injure the finances of the carriers. At the same time, it was plainly acquainted with the unfortunate plight of industries which are producing at a loss on account of high freight rates, but it is a question that can only be answered by the forthcoming decision, expected to be handed down soon, whether the commission is convinced that lower rates would stimulate traffic sufficiently to yield as great or greater net revenues to the carriers than now prevail. This is a matter it is compelled by duty to decide.

Necessity for Reduction

Whatever the outcome may be, it is the firm opinion of shippers, even those showing the most sympathy toward the railroads, that industry cannot be restored to a normal basis until rates are substantially lowered, and not merely reduced slightly. They recognize, however, that the carriers still face high labor costs, although they are in a position to go into the market and buy supplies on a comparatively low basis as the result of liquidation by the iron and steel and other industries. The position was taken by some that general rate reductions will have to be left to natural and gradual processes. But other shippers think immediate substantial cuts are necessary and would be beneficial to the carriers and shippers alike.

Arguments for the carriers were closed by Alfred P. Thom, general counsel for the Association of Railway Executives, who, while covering the general situation throughout the country as it applies to the carriers, took the same attitude that other attorneys for carriers had taken. The railroad attorneys were all in accord with the opinion of Henry Wolf Bikle, assistant general counsel of the Pennsylvania Railroad Co., that the economic situation has a wider basis than the rates and fares of railroads and is the result of the dislocation of industry and the destruction of values produced by the world war. Until this dislocation is corrected, it was pointed out, and new values created by productive effort, real prosperity cannot return, that this return will necessarily be gradual, and that any effort to accelerate it "artificially by striking at the transportation industry will produce reactions which would defeat the very purpose intended to be accomplished." Low earnings of carriers were repeatedly cited and it was declared that while expenses of operation have been to some extent diminished, they have not been diminished to such an extent as to permit further general reductions in rates, unless these reductions are preceded by reduction in wages. Mr. Bikle said that a 1 per cent reduction in freight rates would mean something over $4,000,000 to the carriers of the country; that no one seemed to think that any stimulation of business would result short of at least a 10 per cent reduction, and that it was obvious "that such a reduction would be impossible." He further said that the testimony indicated that no stimulation of business would result from reductions of this character since the depression in business had resulted irrespective of the reductions in prices by producers, and that a small additional reduction which might be possible if the freight rates were reduced would "certainly have no more effect than the large reductions in prices already made." Shippers made a directly opposite argument.

Ore Mining Interests

Speaking for ore mining interests in New Jersey, and most of the steel industry of the country, except Buffalo district producers, Charles S. Belsterling appeared before the commission last Thursday afternoon and strongly urged cuts in railroad rates as being necessary to restore normal activity in the iron and steel markets. Asked by Commissioner Meyer what specific reductions he recommended, Mr. Belsterling said that the 40 per cent increase in rates effective on Aug. 26, 1920, should be wiped out as to iron ore and limestone; that rates on coal should be substantially lowered, and that rates on ore from New Jersey mines should be accorded equality with ex-lake and import ore rates. Iron and steel rates also should be reduced, he said, in line with any proposals that may be made to cut class rates.

Commissioner Potter asked Mr. Belsterling if the steel people should not give the commission cost figures and prices that are necessary to start the industry again. Mr. Belsterling pointed out that the evidence put into the record by iron and steel manufacturers showed plainly that they are producing in many lines at a loss and that rates being such a big item in steel production they must be reduced if the public is to be induced to begin buying again on a normal basis.

Mr. Belsterling insisted that the depression in iron and steel has been particularly prolonged unwarrantedly and uneconomically by high rates on finished material. He declared that the depression is not due to a lack of a desire or of power to buy but the refusal to buy at peak prices.

"The public will buy if prices are low enough," he said. "The steel industry has liquidated but the railroads have not, and the depression is the result. It is not possible to bring steel prices down to a normal level unless freight rates are brought down."

He pointed out that there was no commodity that is transported in interstate commerce in which the freight rate is of more importance than steel as it affects the consumer, because it requires from six to seven tons of raw material to produce a ton of finished material. It was insisted that steel manufacturers cannot forever continue to produce at a loss as they are doing to-day with railroad rates on a war basis. Replying to contentions of counsel for railroads during rebuttal proceedings that the public would not benefit if rates on iron and steel products were lowered, Mr. Belsterling said that the public would benefit.

Rates from New Jersey Mines

To show the high rates on iron ore from New Jersey mines, Mr. Belsterling says there is a charge of $2 per ton for a haul of 75 miles as against the import

rate of $1 per ton from Constable Hook, N. J., to Bethlehem, Pa. It was declared that a buyer was in the market recently for 100,000 tons of pig iron, but that the eastern Pennsylvania blast furnaces could not compete for the business on account of the low import and high domestic rates. But few blast furnaces are operating in eastern Pennsylvania, it was said, while not more than one mine in New Jersey is operating. In 1920, said Mr. Belsterling, ore shipments from lower lake ports to Eastern furnaces at a rate of $1.50 per ton totaled 3,500,000 tons, from New Jersey mines they amounted to 500,000 tons and import shipments totaled 1,250,000 tons. With a rate of $2.25 in 1921, respective shipments were declared to have been 20,000, 100,000 and 1,300,000 tons.

Combatting the views of Mr. Belsterling as to recommendations for rate reductions, Francis B. James, representing iron and steel interests in the Buffalo district, protested against cutting rates on iron ore from lower lake ports and urged reduction in rates on coal and coke. His argument was in line with testimony given by Buffalo producers and as made on several occasions with regard to plans to reduce ex-lake ore rates from lower ports to interior furnaces. He maintained that the rates on iron ore from and to the points mentioned are only 37.08 per cent of the rates on coal to lake front furnaces, although prior to the advance in rates on June 25, 1918, rates on ore were 50 per cent of the rates on coal.

"The carriers should first remove the monstrosity in the freight rates structure at the head of the lakes as to the ore rates and then reduce the coal and coke rates in line with the ore rates and after the coal and coke rates have been reduced relatively, so as to make them relatively just and reasonable as compared with the ore rates, then the ore rates and coal and coke rates should be simultaneously reduced," said Mr. James.

Proposed Reduction

He said that the trunk lines handling ex-lake ore had formulated a plan to file on March 16 tariffs, proposing to make effective on April 17, a 20 per cent reduction. It also has been reported that the reduction proposed is 14 per cent. The charge was made by Mr. James that the carriers are proposing to cut their rates on ex-lake ore so they would be able to say they had so depleted their revenues that they could not afford to make reductions on coal. By this means, he said, they would increase the disproportion between rates on ore and coal, which, he said, using the pre-war level as a base, was as 62 to 165.

He also charged that the tariffs of the carriers reducing by 28 per cent rates on ore other than ex-lake, filed to become effective April 1, were intended as an entering wedge to reducing ex-lake ore rates, the 28 per cent cut removing the 40 per cent advance of 1920. He quoted the resolution of the Trunk Line Association at its meeting on Feb. 24 when it also went on record in favor of restoring import iron ore rates, which have been reduced, to the basis in effect on Dec. 31, 1921. The resolution also called for restoration of rates on chrome and manganese ores to the basis in effect on the date named and where they were published as import rates they should be published effective April 1 as domestic rates.

Mr. James not only attacked the proposed cuts in ore rates and called for suspension of tariffs providing such action, but attacked the rebuttal evidence of the carriers as being an effort to prevent a reduction in the rates on coal. One effect of the heavy increases in rates on fuel, Mr. James said, is that steelmakers find it cheaper to allow their investment in by-product coke plants to lie idle and buy beehive coke. This, it was stated, reduced railroad tonnage because by-product ovens use 57,000,000 tons of coal to produce 40,000,000 tons of coke, and the carriers are given the latter tonnage in place of 57,000,000 tons of coal.

Cost of Pig Iron

F. L. Ballard, speaking for the Eastern Pig Iron Manufacturers, said the freight cost of assembling raw materials to make a ton of pig iron was $13 and the selling price was only $20.50, compared with a cost of nearly $24. The blast furnace interests, it was said, had deflated their costs except the cost of freight on their inbound material. He remarked that the pig iron industry is not of a mushroom growth, but had been established where it is in pre-revolutionary war days. High freight rates, Mr. Ballard said, had helped to cut the production to about one-fourth of normal.

Whatever the justification for the opinion may be, considerable significance was placed on the argument of Wilbur LaRoe, Jr., who appeared on behalf of his partner, former Chairman Edgar E. Clark of the Interstate Commerce Commission, who is ill as the result of an operation. Mr. Clark was to have spoken for the Chicago Association of Commerce. Mr. LaRoe said that a moderate reduction on all commodities, if any were possible, would be the only wise course for the commission to follow. He explained that he had not an opportunity to consult with Mr. Clark, but felt that he was presenting his general idea correctly. He said that the former chairman had taken the position of his client only after having considered it for himself.

"The association is not asking for a reduction in rates," said Mr. LaRoe, "although the business of its members has been restricted in such a way as to suggest that the percentage increases in rates caused the restriction. Its position is that if any reduction can be made, it should be given to all freight and that picking out this, that or the other commodity would lead to discrimination and dissatisfaction. The burden of freight rates falls on the whole nation."

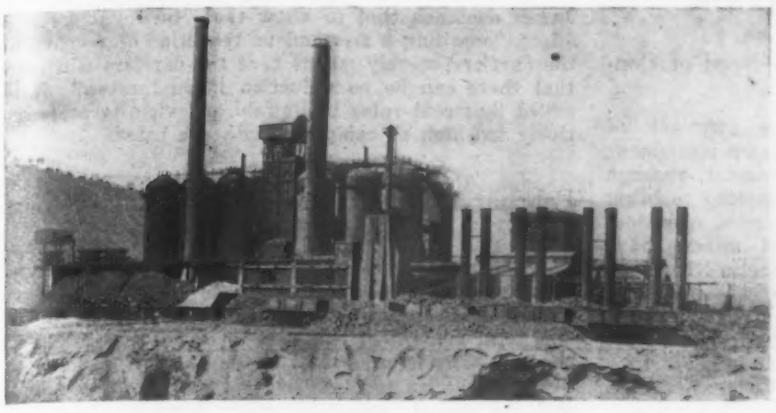
Moderate Reduction

Chairman McChord asked Mr. LaRoe what he called a moderate reduction. The latter suggested 10 per cent, with nothing beyond 15 per cent. He argued against the more or less generally circulated suggestion that commodity rates might be cut with advantage to the country, but not class rates. He referred to such a procedure as being untenable and as tending to increase the advantage of the big shipper and the disadvantage of the smaller shipper. Doubt was expressed that statistics in the record warranted any reduction in any rates, but said that if the commission comes to a different conclusion, the Chicago Association of Commerce was firmly of the opinion that the benefit should be given to every article and not to selected ones. He admitted, however, that the record "seemed to show the country needed help in the form of reduced freight rates." He was strongly opposed to a reduction in passenger fares, thus taking a position diametrically opposite to that of attorneys for some State commissions.

"Wouldn't it be better for industry to stabilize itself on the present freight rates than to make a reduction of, say, 10 per cent now, and hold out a hope of another reduction in, say, six or eight months from now?" asked Commissioner Potter.

"Stabilization and certainty about freight rates certainly would be the best thing that could happen to the country," replied Mr. LaRoe, who conceded that certainty regarding freight rates was one thing the commission could not assure.

Attorney Rush C. Butler, representing the National Coal Association, strongly urged reductions in rates on bituminous coal, saying that rates on this product should be given special consideration because of its economic importance. He contended that lower rates on bituminous coal will reduce the unit operating expenses of the carriers; reduce the cost of materials and supplies used by them; reduce the market price of fuel coal to carriers and that such savings in coal costs alone will be sufficient to compensate for a substantial reduction in rates on fuel. He estimated that reduced rates on coal of 60c. per ton would release nearly $1,000,000 a day in additional purchasing power which would be a strong stimulus to business revival and said the coal rates should not only be reduced but reduced to the bottom. Lower freight rates on industrial coal, he said, will also tend to re-establish normal production in industry. Over 50 per cent of the delivered cost of coal, it was declared, consists of freight rates. The average freight rate on soft coal was said to be $2.27 per ton while the average price of soft coal f.o.b. mines is $2.13 per ton.



Blast Furnaces of Hoskins Works at Lithgow, New South Wales, Australia

THE accompanying illustrations will serve to show the character of the blast furnace plant at Lithgow, New South Wales, Australia, of the Hoskins Iron & Steel Co., Ltd. Each of the two blast furnaces has four hot stoves. Alongside of each stack is one of the hot stoves and behind the stack and the one hot stove are the remaining three. The four hot stoves and the stack thus occupy a rectangle in plan.

The smaller photographic reproduction shows the open air sandcasting beds which are spanned by a 120-ft. crane. One of the crane runways may be seen and also the dust catchers. A vertical raw material elevating equipment serves both furnaces. Turbo-blowers are used for the blast, one of a capacity of 40,000 cu. ft. per min. at 18 lb. per sq. in. and two of 20,000 cu. ft. capacity.

At the Lithgow works, besides making pig iron and ferromanganese, the company produces steel blooms and billets, rails and fastenings, and structural, spring and agricultural steel. There is an iron mine at Cadia, 100 miles from Lithgow, and a limestone quarry 35 miles from Lithgow. There is a coke oven at Lithgow and also one at Dapto. The company makes cast iron pipe at Rhodes and at Sydney.

BRITISH FOREIGN TRADE

Further Increase in Steel Exports in January—Sharp Decline in Imports

The January official returns of British foreign trade in steel and iron shows that the upward swing in exports, which has been a feature of recent months, was continued in January. The total exports were 261,119 gross tons, excluding iron ore and including scrap. This compares with 211,314 tons in December and with an average per month of 93,804 tons in the third quarter of last year. In January, 1921, the exports were 233,114 tons.

Iron and steel imports in January were 100,178 tons or much less than the influx late in 1921. In the last quarter these imports were 168,687 tons per month. In September they were 229,391 tons. The following table shows comparative data:

British Steel Exports and Imports, Gross Tons

	Exports	Imports
October, 1921	161,683	189,536
November, 1921	202,059	184,064
December, 1921	211,314	132,463
January, 1922	261,119	100,178
Average per month, 1919	188,519	50,801
Average per month, 1920	274,881	128,685
Average per month, 1921	144,885	152,734
Average per month, 1913	420,757	195,264

The trend of some of the principal exports is shown by the following data:

Principal British Exports, Gross Tons

	Average per Month		January	
	1913	1921	1921	1922
Pig iron	78,771	8,602	13,561	24,409
Steel rails	41,676	14,698	17,953	35,928
Steel plates	11,162	10,673	26,318	4,851
Galvanized sheets	63,506	17,635	19,774	55,560
Steel bars	20,921	8,927	17,362	13,225
Tin plates	41,208	18,873	33,822	34,275
Black plates	5,679	1,173	1,426	2,643
Steel sheets	.....	.....	5,625	6,803

Exports of steel rails, galvanized sheets and tin plate have shown the most marked recovery in the above products.

Pig iron imports in January were 31,346 tons as compared with a monthly average in 1921 of 55,564 tons.

Iron ore imports in January were 193,244 tons, which compares with a monthly average in 1921 of 157,298 tons.

Manganese ore imports in January were only 3806 tons. In 1921 they were 14,405 tons per month and in 1913 they were over 50,000 tons per month.

Poor Outlook for Machinery in Far East

The outlook for selling very much American machinery in the Far East does not look promising according to B. A. Tozzer, Cleveland sales manager of the Niles Tool Works and the Pratt & Whitney Co., who recently returned from a 14-months trip during which he visited China, India, Japan, Java and other Far Eastern countries for the purpose of seeing what the prospects were in those countries for selling machine tools. Mr. Tozzer made a brief reference to the machine tool situation in the Far East in an address before the Cleveland section of the American Society of Mechanical Engineers, March 7, which for the most part was devoted to a story of his experiences during his trip and the description of scenes shown by lantern slides, a large number of which he exhibited.

"There is no manufacturing, as we understand it, in the Far East," said Mr. Tozzer. "There are no factories where they make things in quantities. Labor saving machinery does not appeal to the people over there because labor is so cheap. The arsenals, ship yards and railroad shops are the only shops where they use high grade machinery. Some machinery is required for repair work of various kinds, but outside of the three fields I named we cannot compete for business because of the low grade, cheap machinery made in Germany and Japan."

Freight Rates Reduced

As a result of efforts by the Traffic Bureau of the Youngstown, Ohio, Chamber of Commerce freight rates on iron and steel and other commodities from the Mahoning and Shenango Valleys to North and South Carolina have been placed on the Pittsburgh basis. This effects a saving up to 6c. per 100 lb. on shipments of iron and steel products. An effort is being made to effect a similar equalization on shipments from the Youngstown district to Kentucky and Tennessee.

COAL STRIKE OUTLOOK

Efforts to Prevent Work Stopping—Need of Continuous Production

WASHINGTON, March 14.—With the approach of April 1, the date set for the strike of union bituminous and anthracite coal miners, the Government, through Secretary of Labor Davis, still is attempting to bring about conferences between bituminous mine operators and miners. Anthracite operators and miners have agreed to meet and will have a conference in New York to-morrow. Refusal of coal operators of western Pennsylvania and southern Ohio bituminous fields to meet miners for the purpose of negotiating new wage agreements has complicated the situation, and unless they change their attitude it is believed by Government officials that a strike is inevitable.

Nothing has come from Government sources to verify reports that the President, acting on the precedent of former President Roosevelt in the anthracite situation of 1904, might use the powers of his office to force an agreement between the operators and miners. While it is evident that the country is showing less concern over the threatened strike than it would have if it were scheduled to take place during the cold months, it is claimed here that the situation requires the most serious attention.

Granting that the output of non-union mines is sufficient to keep industries going at their present rate of operation and that even transportation would be hurt but little for the present, the view is taken that production should be continued on a normal basis in order to prevent a fuel famine next winter. Meanwhile, production of soft coal continues to increase slowly. The total output for the week ending March 4, including lignite and coal coked, is estimated by the Geological Survey at 10,536,000 net tons, an increase of 162,000 tons, or 1.6 per cent over the week preceding. Production is still some 2,600,000 tons short of the maximum reached just before the mine strike of 1919, an even 500,000 tons less than in the third week of last October, when consumers were expecting the railroad strike.

Until the forthcoming report on stocks as of March 1, is ready the present level of stocks will not be known with certainty, but according to the Geological Survey it will probably require putting another 10,000,000 tons into storage to raise consumers' reserves to the level reached at the close of the war. Since Jan. 1, production has exceeded consumption and it is claimed that consumers have added materially to their stocks.

The Geological Survey estimates that the output of bituminous coal in 1921 totaled 407,000,000 net tons.

Opposed to Ore Rate Reduction

WASHINGTON, March 14.—In a formal statement filed yesterday with the Interstate Commerce Commission by Attorney Francis B. James, representing Buffalo district iron and steel producers, request is made that the commission suspend all tariffs reducing rates on iron ore. As is known, railroads have filed tariffs proposing a reduction of 28 per cent, on April 1, of rates on iron ore, except ex-lake ore, in official classification territory.

Mr. James says in a statement that the carriers also propose to make a reduction of 20 per cent in the ex-lake ore rates and that tariffs for this purpose will be filed about March 16, to become effective about April 16. The statement of Mr. James reaffirms the contention of Buffalo producers that rates on coal should be reduced first. It is charged that the carriers at the last moment "are resorting to many ingenious devices to shrink their revenues on other species of traffic so as to persuade the Interstate Commerce Commission not to reduce the rates on coal."

Mr. James also states that "the carriers admit that the proposed reduction in rates on iron ore is a part of a scheme to equalize assembling costs, a principle universally condemned by the commission." The tariff reducing rates on ore, it is said, should be suspended so that the whole subject may be investigated. Mr. James contends that to allow these tariffs to go into effect, "entailing a tremendous reduction of revenue to the carriers, merely means that the carriers will urge that there can be no reduction in coal rates." It is added that coal rates to Buffalo and vicinity are relatively too high as compared with ore rates.

February Construction Far Ahead of Last Year

February construction activity was 73 per cent greater in volume than it was in the corresponding month of last year, according to the F. W. Dodge Co. The total amount of contracts awarded last month in the 27 Northeastern States of the country amounted to $177,365,000, an increase of 7 per cent over January, and the second largest February total on the Dodge company's record.

A significant feature of the February construction record is the increase in business buildings over January. The increase in square feet of space contracted for was 30 per cent, and the increase in total cost was 65 per cent. February business buildings amounted to $39,180,000, or 22 per cent of the month's total, an unusually high percentage for this class, which was exceeded only by residential building, amounting to $75,703,000, or 43 per cent of the total. Public works and utilities took third place, amounting to $21,193,000, or 12 per cent of the total.

The accumulated volume of construction since the first of the year has been 60 per cent greater than in the first two months of last year. Contemplated new work reported in the first two months has amounted to over $800,000,000, or more than double the amount of work placed under contract in the same period.

Corporation's Unfilled Orders Decline in February

The unfilled business on the books of the United States Steel Corporation as of Feb. 28 last amounted to 4,141,069 tons, or 100,609 tons less than reported on the books Jan. 31. In January the unfilled tonnage decreased 26,736 tons; in December, increased 17,872 tons; in November and October, decreased 35,287 and 273,841 tons respectively; in September, increased 28,744; whereas previously decreases were reported each month from August, 1920. A year ago the unfilled business amounted to 6,933,867 tons, or 2,792,798 tons more than on the books Feb. 28, last. At the close of February the Steel Corporation had less unfilled business on its books than it had before since December, 1914. The monthly unfilled tonnage since January, 1920, compares as follows:

	1922	1921	1920	1919
Jan. 31	4,241,678	7,573,164	9,285,441	6,684,268
Feb. 28	4,141,069	6,933,867	9,502,081	6,010,787
Mar. 31	.....	6,284,765	9,892,075	5,430,572
Apr. 30	.....	5,845,224	10,359,747	4,800,685
May 31	.....	5,482,487	10,940,465	4,282,310
June 30	.....	5,117,868	10,978,817	4,892,855
July 31	.....	4,830,324	11,118,468	5,578,661
Aug. 31	.....	4,531,926	10,805,038	6,109,103
Sept. 30	.....	4,560,670	10,374,804	6,284,638
Oct. 31	.....	4,286,829	9,836,852	6,472,668
Nov. 30	.....	4,250,542	9,021,481	7,128,330
Dec. 31	.....	4,268,414	8,148,122	8,265,366

The largest total of unfilled orders was on April 30, 1917, when it was 12,183,083 tons. The lowest was on Dec. 31, 1910, at 2,605,747 tons.

Bonds for Schneider et Cie. Offered

J. P. Morgan & Co. are offering at a price approximating par an issue of $10,000,000 7½ per cent bonds of Schneider et Cie., the well known French steel manufacturer with principal works at Creusot.

Machine Tool Builders to Meet in April

The National Machine Tool Builders' Association will hold its spring meeting at the Hotel Traymore, Atlantic City, N. J., April 25 and 26.

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ESTABLISHED 1855

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Capital Charges and Labor Costs

It is profitable to note the change in the attitude of manufacturers toward capital charges in production costs. In appraisals recently of properties of a number of steel companies, for instance, iron ore rights providing a 30-year supply were not valued at much more than those providing a 20-year supply, the advantage of the longer period being rated much lower than would have been the case a few years ago.

Comparisons are also being made between blast furnaces, the most recently constructed, which involve all conceivable refinements for reducing the muscular effort necessary for operation and the slightly older furnaces whose designers were not so extremely particular.

Just after the armistice every one who contemplated improvements laid great stress upon what appeared to be the obvious necessity of reducing the employment of labor to the absolute minimum. Labor, to use a general though somewhat unfortunate term, appeared destined to be permanently scarce, at least in periods involving maximum production, and manufacturers were prepared to go to greater lengths than ever before in investing capital for reduction in the amount of labor required. The feeling in the past few months has been that the pendulum has swung too far.

A broader study of economic conditions might have prevented men from going so far in their appraisals of the future of labor supply. It is not necessary to produce goods for which there are no consumers, and the test frequently applied to mathematical formulas might have been used. Suppose we produced everything by entirely automatic means, what would be the condition? The channels of trade could be kept open only by men finding work in new occupations, and so radical a change could be effected only very gradually. Scarcity of labor ordinarily develops from savings being spent too rapidly, and therefore at a pace that cannot be maintained. That is equally true whether the savings are spent on things that do not last or in investment construction that does last.

This is not the first time that men have changed their appraisals as to the amount of capital that may properly be tied up. The boom in Connellsville coking coal land of somewhat more than ten years ago will be recalled. Connellsville coal changed hands at prices up to $2,000 and $2,500 an acre, and when in 1909 an attempt was made to form a combination of the merchant properties in the Connellsville region the prices asked by many operators ranged from $3,000 to $4,000 an acre. Computation readily showed that to carry the coal at such values required coke as produced to yield a margin which the market had never afforded and therefore was not very likely to furnish. The dénouement was marked by the interesting event of the United States Steel Corporation, which had never held such exalted views of the value of coal in the ground, buying the Colonial Coke Co. properties from the Pittsburgh Coal Co. at a price involving about $1,000 an acre for the 7000 acres.

To choose between a large capital outlay and a small current expense and a smaller capital outlay and a larger current expense requires particular farsightedness, for the capital charge once shouldered is permanent, whereas the current expense may be modified from time to time. Especial care is needed when the question is one of deciding upon a capital investment that involves spending the money upon labor, for if labor becomes more plentiful the replacement cost of the facilities constructed decreases while at the same time their economy—the dollars in labor that they save—is reduced.

Aside from the rapid increase in British steel exports in January to a figure far in excess of the American total, as shown elsewhere in this issue, the outstanding feature is the expansion in exports of British galvanized sheets. The January movement was 55,560 tons, a figure not approached since the pre-war days. In 1912 and 1913 the monthly averages were 54,900 and 63,500 tons respectively. The recent expansion dates from October, galvanized sheets now approximating one-fifth of the total exports, or not far below the pre-war movement. In decided contrast there is not only the low volume of total iron and steel exports from the United States, but also the more marked decline in

our shipments of galvanized sheets, approximating in recent months only about one-third of those before the war.

Fortunate Deflation in Steel

As consumers look back over the period of liquidation in steel they have reason for congratulation that strong hands were in control. Large though losses have been, they easily might have been far greater had there not been resistance to demands for drastic cuts. The recessions in late 1920 were sharp and prices fell rapidly to proximity with pre-war levels, which were everywhere made a measure of deflation. Nearer the pre-war basis for a long time (and still so) than any products save those of the farm and a few non-ferrous metals, conspicuously copper, the descent in prices was nevertheless not so precipitous as to prevent the disposal of accumulated consumer stocks. More than one steel user, as a result of this orderly readjustment, has been saved from going to the wall. Overwhelmed at the end of 1920 with shipments from a number of sellers, whereas he expected to be served by only one of those from whom he bought, the steel user has had all of 1921 for distributing his surplus in a market of gradually receding prices. At the outset, to be sure, he did find prices dropping at a rate of $4 per ton per month, but for most of 1921 the rate was less than $2 per ton and at the year end less than $1. There is some satisfaction in realizing that conditions might have been worse. Losses admittedly great might have been widely disastrous if the leaders in the trade had not realized that price was a secondary factor in a market glutted with materials and that required as extended a deflation as possible.

Not "Economic Hallucinations"

In a recent address on "Some Economic Hallucinations," by Theodore H. Price, editor of *Commerce and Finance*, the so-called cycle theory of business depressions was sharply attacked. Mr. Price said that the theory assumes an alternation of business prosperity and prostration and insists that because we have been successful for a time we must then be unsuccessful for a while. He declared that most people have surrendered themselves to the theory so completely that they often bring on hard times by vociferously insisting that they are due. The "agonizing deflation" through which we have recently passed he considered to be largely attributable to the fact that some highly placed personages who had the power to make their prophecies come true were obsessed with a belief in the cycle theory.

Mr. Price uses extreme language in stating the theory, and he is to some extent right if we grant that it is adhered to rigidly and that at certain definite times there will be business depression. Such a conviction will unquestionably have a depressing influence and help to end prosperity. Some people certainly have made the theory of cycles mechanical and have followed it too far. In Ohio for many years Farmer Benner issued prophecies based on the cycle theory and won a fame that endured for a considerable time, but finally ended in a crash. Despite the fact that Benner often made a hit in his prophecies, he sometimes failed in part, and in 1907 failed completely when he not only did not foresee the panic of that year but predicted great prosperity.

It is true that business history shows periods of prosperity and depression which have come with a measure of regularity, and it certainly cannot be maintained that all belief in the recurrence of depression in the industrial world is due to hallucinations. Human nature being what it is, every period of prosperity has brought transgression of economic laws, and the broken laws would not be denied their penalty. Great harm has been done, however, by gloomy forebodings. Much can be accomplished by not looking for depression at any time and to ameliorate conditions when prosperity wanes. Much has been accomplished by the Federal Reserve Bank, with its adjustment to credit requirements, and other ways of meeting financial stress and unemployment will be found.

Mr. Price also calls an hallucination the belief that the world is poorer as a result of the war. He claims that nearly all of the products of human energy are consumed or wear out in seven years, whether we are at peace or war, and hence that we are not poorer on account of the war. He overlooks the tremendous energy wasted by war, which if applied to the aims of peace would have accomplished results of great value. There was also tremendous loss in efficiency during the war and for several years after, that has not been recovered and probably will not be in a long time.

Mr. Price stands on better ground when he opposes the belief that we cannot prosper unless we continue for all time to sell more than we buy, collecting the difference between the accounts in cash. We must both buy and sell, and so long as the buying and selling are profitable, the balance of trade is not the all-important consideration.

Pig Iron Shrinkage in 1921

Production of pig iron in 1921 is officially reported at 16,688,126 tons, of which 16,593,396 tons was coke and anthracite iron. As the production figures month by month were compiled by THE IRON AGE, the year's total of coke and anthracite given in the issue of Jan. 5 being 16,543,686 tons, or only 50,000 tons different from the official figure given now, the chief interest in the statistics at this later date is in the details. The distribution by grades varied little from 1920 to 1921, even though there was a decrease of 55 per cent in the total. Malleable, forge and ferromanganese each decreased about 65 per cent, while Bessemer and basic decreased less than 54 per cent.

A remarkable divergence in the 1921 statistics is the small proportion of steel-making iron reported as being made for sale. In 1920 12.8 per cent of the basic iron production was given as made for sale, while in 1921 the proportion was only 7.3 per cent. In the case of Bessemer and low phosphorus iron the decrease was from 9.1 per cent to 7.3 per cent. It may be suggested that in 1921 some steel works sold pig iron which had originally been made for their own use and that all such iron may not have been reported as having been made for sale when as an actual fact it was not made for sale, the sale being a subsequent development. In that event the consumption of pur-

chased iron would not be altogether so small as suggested by the statistics, but the fact would remain that merchant furnaces did not make the iron.

Taking all grades of pig iron, the percentages of the total reported as being made for sale were as follows, beginning with the first year for which these particulars were reported:

1913.....	30.8	1916.....	28.5	1919.....	28.0
1914.....	31.6	1917.....	30.1	1920.....	29.0
1915.....	28.7	1918.....	27.6	1921.....	22.4

The year 1921 is seen to have been unique among the years covered. The divergence is different in character from the change which occurred before 1913 when steel works that had been buying iron built furnaces of their own, partly because they desired to have the advantage of using molten iron. In a few instances the end was attained by buying merchant furnaces.

Assuming that the merchant furnaces delivered no basic iron in molten condition, the proportion of steel works basic iron delivered molten changed only from 83.9 per cent in 1913 to 84.9 per cent in 1920, but in 1921 the proportion dropped to 78.2 per cent. This drop is no doubt attributable chiefly to the intermittent and irregular operation of basic open-hearth furnaces last year, particularly in the early months, cold pig iron being accumulated at works whose regular practice involved direct metal.

The badness of the year 1921 has already been sufficiently commented upon, but mention may be made of the appearance the 1921 pig iron production will present in the annals that will be consulted in the future. There have been other years of light production, but none that represented nearly so great a backward step. The production in 1865 was the lightest in three years, while 1876 showed the lightest in five years, 1894 the lightest in six years and 1908 the lightest in seven years, but the production in 1921 was the lightest in thirteen years. In that respect the year leaves a record that cannot well be beaten. The rate of production at the beginning of this month, as indicated by our blast furnace report last week, was 30 per cent above the average rate in 1921.

Pyrites Cinder and the Blast Furnace

Before the war the greater part of the sulphuric acid output of the country was made from iron pyrites. To-day probably 75 per cent of the pyrites formerly so used has been displaced, acid being made by the burning of brimstone which can be obtained at a lower cost. The change is reflected in the imports of pyrites. In 1912 and 1913 about 975,000 tons was imported in each year. In 1920 imports declined to 332,600 tons and in 1921 to only 216,200 tons.

These facts have a bearing also on the pig iron industry. For many years the cinder from the burned pyrites, commonly known as "blue billy," accumulated in large heaps in the yards of acid manufacturers. Later a campaign was undertaken which resulted in the selling of this cinder to blast furnace plants, and the use of a certain amount of pyrite cinder in blast furnace mixtures has continued to the present time. Recently the question of swollen blast furnace linings, due to an absorption of zinc by the brick, was discussed in these columns. With the exception of the pyrites coming from Spain, that which was used by American acid makers contained a moderate amount of zinc which remained in the cinder. It is reasonable to infer that blast furnaces which used blue billy freely had marked trouble from the zinc-impregnated brick. Now that pyrites cinder is to figure in blast furnace mixtures to a much smaller extent than before, less zinc-carrying material will be charged and the troubles due to zinc impregnation should largely disappear.

CORRESPONDENCE

Liquidation of 50 Per Cent Ferrosilicon

To the Editor: We have noted with great interest your editorial on page 597 in THE IRON AGE, March 2, on the subject of the extreme post-war liquidation in regard to 50 per cent ferrosilicon.

Everything that you say is true, although you might have enlarged on the point that, because of lack of tariff protection, what little business there has been available has largely gone to foreign producers.

It is truly stated by you that war demand was such an incentive to the installation of new plants that they were developed in excess of to-day's needs. There is very much more electric furnace plant installation for making 50 per cent and higher grades of ferrosilicon than the country can possibly keep busy in the next several decades; and yet, essential as these plants were during the war, it appears that the industry is going to be destroyed and the country once more left dependent on outside or foreign supply, as a result of the dilatory action of Congress in respect to the tariff bill.

Prices at present obtainable for any grade of ferrosilicon are notoriously unprofitable, but there are many users of the commodity who cannot understand or believe this, assuming that because somebody is willing to sell them there must naturally be a profit in the transaction. The real truth is that electric furnace operators making ferroalloys were left at the end of the war with electric power contracts which in many if not in most cases require payment for the power whether it can be used or not. This situation brings to each producer the question of whether to lose some money on the finished product or perhaps more money in paying for power unconsumed; and is the chief explanation why ferrosilicon is selling below its cost of production to-day.

The writer feels quite sure that the other producers of ferrosilicon will, as he does, appreciate your remarks on this subject, and believes there is opportunity to enlarge upon them.

PAUL J. KRUESI,
President, Southern Ferro Alloys Co.

Chattanooga, Tenn., March 7.

Cobalt Magnet Steel

To the Editor: With reference to the interesting announcement on page 350 of your issue of Feb. 2, in which you quoted from the London *Ironmonger*, we beg to mention for the sake of interested parties that the cobalt magnet steel referred to is the invention of P. R. Kuehnrich, chairman Darwin & Milner, Ltd., Sheffield, one of the best known authorities on empirical research work on special alloy steels and the inventor of a number of them, well known to the trade, as for instance, the so-called cobaltcrom steel. Cobalt magnet steel is the product of the Cobalt Magnet Steel Co., Ltd., Sheffield, represented in the United States by Darwin & Milner, Inc., 403 Long Avenue, Cleveland.

DARWIN & MILNER, INC.

Cleveland, March 11.

REVISING STEEL SCHEDULE

Many Changes Said to Have Been Agreed Upon by Majority of Senate Committee

WASHINGTON, March 14.—Revision of the steel schedule of the permanent tariff by Republicans of the Senate Committee on Finance is said to have been tentatively completed except as to several items. Those chiefly under discussion are understood to relate to the ferroalloy section. The committee apparently has reduced House rates on those products but has not as yet fixed the duty on ferromanganese. It is said that manganese ore has been placed on the free list as compared with the duty of 1c. per pound of metallic manganese in the Fordney House bill, and that consideration is being given to the fixing of a ferromanganese duty of 1c. per pound of manganese while the House gave a duty of 2 1/5c. per pound when containing in excess of 1 per cent of carbon and 2 1/5c. per pound and 28 per cent ad valorem when containing less than 1 per cent of carbon. Tungsten ore is said to have been made dutiable at $9 per 20 pounds of tungstic trioxide as compared with 45c. per pound of metallic tungsten in the House bill, which provides no unit basis. Ferrotungsten, made dutiable at 72c. per pound on tungsten content and 15 per cent ad valorem in the House bill, is said to have been given a duty of 9/10c. per pound for each per cent of tungsten content and high-speed tungsten steel and all alloy steels containing tungsten are said to have been made dutiable at 35 per cent ad valorem.

The pig iron duty of $1.25 per ton in the House bill is reported to have been increased to the Payne-Aldrich rate of $2.50 per ton. Rates on ferrosilicon are also reported to have been lowered as well as those on magnesite. While it is said there have been a number of changes in phraseology of the steel schedule, it is reported that as to the general line of rolled steel products no great changes have been made in the House bill, but that some suggestions of manufacturers to make the schedule more scientific have been adopted.

Tentative preparation of the steel schedule has followed conferences held here between members of the Finance Committee, steel makers, ferroalloy producers and others, including those interested in magnesite, etc.

The committee is unable to say when the tariff bill will be reported, but it is said that so much progress has been made that prints of the bill are about ready, and that introduction in the Senate will follow soon; it is claimed that the bill has been written in two forms, one on an American valuation and the other on the foreign valuation plan, the latter taking higher duties than the former, where ad valorem duties apply; many duties are said to have been transferred to a specific basis in order to avoid as much as possible the difficulties as to assigning import levies.

Merger of Rolls Manufacturers Progressing

PITTSBURGH, March 13.—Negotiations which have been in progress for several months, looking toward a merger of three of the leading manufacturers of rolls and rolling mill equipment of the country, are approaching the final stages and an official statement is expected in the next few weeks. The companies involved are the Mackintosh-Hemphill Co., the A. Garrison Foundry Co. and the Pittsburgh Iron & Steel Foundries Co. J. Ramsey Speer, chairman Pittsburgh Iron & Steel Foundries Co., has played an active part in this combination, the fundamental reasons for which are economies of operation and a concentration of products. Although not official, it may be said authoritatively that the controlling factors in the A. Garrison Foundry Co. have sold out their interests and will not be active in the affairs of the new company.

Order for Freighter Placed

CLEVELAND, March 14.—An order for a 450-ft. lake boat for the coal and stone trade has been placed with the Manitowac Ship Building Corporation. This is the first order for a freighter that has been placed with an American Great Lakes shipyard this season.

Dennison K. Bullens, author of "Steel and Its Heat Treatment," was the speaker of a joint dinner and meeting of the Pittsburgh Chapter, American Society for Steel Treating and the Pittsburgh Chapter, American Institute of Mining and Metallurgical Engineers, held Tuesday, March 7, at the Bureau of Mines Building, Pittsburgh.

COMING MEETINGS

March

Refractories Manufacturers' Association. March 15, 16 and 17. Annual meeting, Chicago. Secretary, F. W. Donahoe.

Taylor Society. March 16 to 18. Midwinter meeting. City Club, Philadelphia. Managing director, Dr. H. S. Person, 29 West Thirty-ninth Street, New York.

April

National Federation of Construction Industries. April 3, 4 and 5. National conference, Drake Hotel, Chicago. Association headquarters, Drexel Building, Philadelphia.

National Metal Trades Association. April 19 and 20. Annual meeting, Hotel Astor, New York. Secretary, Louis W. Fischer, Peoples Gas Building, Chicago.

American Gear Manufacturers' Association. April 20, 21 and 22. Annual meeting, Hotel Lafayette, Buffalo. Secretary, F. D. Hamlin, 4401 Germantown Avenue, Philadelphia.

American Supply and Machinery Manufacturers' Association and Southern Supply & Machinery Dealers' Association. Joint Meeting. April 24 to 26, Birmingham. F. D. Mitchell, 233 Broadway, New York, is secretary of the American association and A. M. Smith, Smith-Courtney Co., Richmond, Va., is secretary of the Southern association.

National Machine Tool Builders' Association. April 25 and 26. Spring convention, Hotel Traymore, Atlantic City, N. J. General manager, E. F. DuBrul, 817 Provident Bank Building, Cincinnati.

Society of Industrial Engineers. April 26 to 28. Spring meeting, Hotel Statler, Detroit. George C. Dent, business manager, 327 S. La Salle Street, Chicago.

American Electrochemical Society. April 27 to 29. Spring meeting, Baltimore. Acting secretary, Dr. Colin G. Fink, 110 Park Avenue, New York.

May

Iron and Steel Institute. May 4 and 5. Annual Meeting. Quarters of Institution of Civil Engineers, London, England. Secretary, George C. Lloyd, 28 Victoria Street, S. W., London.

The National Supply and Machinery Dealers' Association. May 8, 9 and 10. Seventeenth annual convention, Marlborough-Blenheim Hotel, Atlantic City. Secretary, T. James Fernley, 505 Arch Street, Philadelphia.

American Society of Mechanical Engineers. May 8 to 10. Spring meeting, Atlanta, Ga. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York.

National Association of Manufacturers. May 8, 9 and 10. Annual Convention, Waldorf-Astoria Hotel, New York. General Offices, 50 Church Street, New York.

National Foreign Trade Council. May 10 to 12 Convention, Philadelphia. Secretary, O. K. Davis, 1 Hanover Square, New York.

National Sheet Metal Contractors' Association. May 15 to 19. Convention and exposition, Cadle Tabernacle, Indianapolis.

National Association of Purchasing Agents. May 15 to 20. Annual convention and exposition. Exposition Park, Rochester, N. Y. Secretary, H. R. Heydon, 19 Park Place, New York.

American Iron, Steel & Heavy Hardware Association. May 23 to 25. Annual meeting, Hotel Washington, Washington. Secretary, A. H. Chamberlain, Marbridge Building, New York.

American Society for Steel Treating. May 25 and 26. Sectional meeting, Pittsburgh. Secretary, W. H. Eisenman, 4609 Prospect Avenue, Cleveland.

Iron and Steel Markets

INCREASE IN DEMAND

Larger Scale of Operations Continued

Coal Strike, Spring Demand and the Effort to Raise Prices Are Leading Factors

An increased demand for steel products is more plainly indicated, but throughout the trade great care is taken lest its extent be overstated. Operations continue at the higher rate shown by February statistics. For the Steel Corporation they are slightly under 60 per cent this week and for the whole industry are probably between 55 and 60 per cent.

Buyers and sellers are watching closely for developments in three directions—the coal strike, spring demand, and the effort of the steel companies to advance prices on plates, shapes and bars.

A strike at union mines on April 1 is everywhere expected and there is more disposition this week to believe that some of the recent buying of steel was precautionary. Non-union mines can increase their output, but some independent steel companies have only union properties. As to spring demand for steel, it is not considered to have figured largely in the buying of recent weeks and its volume remains to be gaged.

Results from the effort to advance prices on plates, shapes and bars cannot be measured as yet, but several steel companies are now holding for 1.50c., while others have advanced $1 to $2 above their low quotations. The Steel Corporation, it appears, did not go below 1.35c. in the recent breaks and 1.40c. is now more commonly maintained on the three heavy products than in a number of weeks.

A factor not easily determined is the amount of protection given consumers at the low prices. The immediate effect of the higher quotations has been favorable in the heavy products, and there is less pressure for low prices on other forms of finished steel.

The gradual broadening of railroad demand is not to be underestimated as a hopeful feature. The last rail order is 18,000 tons for the Chesapeake & Ohio. For the New York Central 1000 box cars have been placed and indications are that the St. Paul, which has inquired for 1000 cars, will actually buy 4500. This road is inquiring for 50 locomotives and the Florida East Coast has bought 10.

Indications are that miscellaneous railroad buying will be a considerable factor in the near future. For track supplies there are numerous small orders apart from 5000 kegs for the Pennsylvania and 3000 kegs for the Southern Pacific. At Chicago 2c., Pittsburgh, is the price, but in Eastern Pennsylvania business has been done as low as 2.20c. at mill. The rail mill at Gary is turning out 35,000 tons per month and bookings are sufficient to maintain this rate through the year.

The Steelton mill of the Bethlehem Steel Co., which has been out of the girder rail market for several years, is now actively competing for trolley line business. Boston reports contracts for 4700 tons in the past week.

Including 11,850 tons for an ore dock at Superior, Wis., for the Great Northern, fresh structural steel work totaled over 33,000 tons. Awards were, roughly, 24,000 tons.

Improvement in the demand for sheets continues and the operation of the mills is better than in several months. Automobile buying is larger. Bookings of the American Sheet & Tin Plate Co. last week were the heaviest in two years.

Recent buying of steel bars at Chicago, while largely for replenishment, has been in part for seasonal needs. Bar mills are not likely to feel the effect of the advances in farm products for some months.

Jobbers have been buying wire and nails more freely and in some cases have acquired stock for the coming season.

Export trade has improved in spots and on a few products slight advances have been secured. New inquiries for rails for Japan amount to 18,000 tons and some rail business is pending in Brazil.

Many sales of foundry pig iron for prompt delivery are being made and there is evidence of increasing melt, particularly in the East, but transactions are not large and they have caused no advance from the low prices recently named in Buffalo, Birmingham and some other centers. At Pittsburgh basic pig iron is 25c. higher, going to $18, Valley, on a sale of 1000 tons.

Recent buying of steel scrap and blast furnace turnings by several steel plants in the Pittsburgh district at advancing prices has caused a flurry in the scrap market as dealers have tried to cover on their orders. The highest prices since early in 1921 have been realized.

Pittsburgh

PITTSBURGH, March 14.

On the whole the effect of the recent lifting of quotations on plates, shapes and bars upon the general steel market has been favorable, although the new base as yet has little or no foundation in sales and the claim is made by the important buyers of these products that they still are able to place business at 1.35c. to 1.40c. There is no question that the general structure of prices has been strengthened by the action of the leading Pittsburgh independent, which has been followed by all other independent companies. The Carnegie Steel Co. has not made a public announcement as to prices for some time, contenting itself with going along with the general market.

A good many wavering orders have been driven in by the advance and if the market actually has not reached the new basis, at least there has been almost complete disappearance of quotations of less than 1.40c. Another favorable development of the withdrawal of the extremely low prices on the heavy tonnage products has been to lighten the pressure for lower prices on other lines of finished steel. When plates, shapes and bars could be bought as low as 1.30c., buyers of other products naturally felt that prices of these other products could not be maintained and were inclined to order sparingly.

For some time past it has not been a lack of needs so much as a lack of confidence in the maintenance of prices that has retarded business. The market reflects a more cheerful undertone, but the idea that a return

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Mar. 14, 1922	Mar. 7, 1922	Feb. 14, 1922	Mar. 15, 1921
No. 2X, Philadelphia‡	$21.26	$21.26	$21.34	$27.96
No. 2, Valley furnace†	19.00	19.00	18.75	26.00
No. 2, Southern, Cin'ti†	19.50	19.50	20.00	29.50
No. 2, Birmingham, Ala.†	15.00	15.00	15.50	25.00
No. 2 foundry, Chicago*	20.00	20.00	18.00	25.00
Basic, del'd, eastern Pa.	19.84	19.84	19.84	26.26
Basic, Valley furnace	**18.00**	17.75	17.75	25.00
Valley Bessemer, del. P'gh	21.46	21.46	21.46	28.96
Malleable, Chicago*	20.00	20.00	18.00	25.50
Malleable, Valley	19.00	19.00	19.00	26.00
Gray forge, Pittsburgh	20.71	20.71	20.71	26.96
L. S. charcoal, Chicago	26.00	26.00	30.50	38.50
Ferromanganese, seaboard	62.50	62.50	62.50	90.00
Rails, Billets, etc., Per Gross Ton:				
O.-h. rails, heavy, at mill	$40.00	$40.00	$40.00	$47.00
Bess. billets, Pittsburgh	28.00	28.00	28.00	38.50
O.-h. billets, Pittsburgh	28.00	28.00	28.00	38.50
O.-h. sheet bars, P'gh	29.00	29.00	29.00	40.00
Forging billets, base, P'gh	32.00	32.00	32.00	43.50
O.-h. billets, Philadelphia	33.74	33.74	33.74	44.24
Wire rods, Pittsburgh	36.00	36.00	36.00	52.00
	Cents	Cents	Cents	Cents
Skelp, gr. steel, P'gh, lb.	1.40	1.40	1.50	2.35
Light rails at mill	1.40	1.40	1.50	2.35
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	1.71	1.71	1.76	2.45
Iron bars, Chicago	1.55	1.55	1.60	2.60
Steel bars, Pittsburgh	**1.40**	1.35	1.40	2.00
Steel bars, Chicago	1.50	1.50	1.55	2.38
Steel bars, New York	**1.78**	1.73	1.78	2.38
Tank plates, Pittsburgh	**1.40**	1.35	1.40	2.00
Tank plates, Chicago	1.50	1.50	1.55	2.38
Tank plates, New York	**1.78**	1.73	1.78	2.38
Beams, Pittsburgh	**1.40**	1.35	1.40	2.10
Beams, Chicago	1.50	1.50	1.55	2.48
Beams, New York	**1.78**	1.73	1.78	2.48
Steel hoops, Pittsburgh	1.80	1.80	1.90	2.80

Sheets, Nails and Wire,	Mar. 14, 1922	Mar. 7, 1922	Feb. 14, 1922	Mar. 15, 1921
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 28, P'gh	3.00	3.00	3.00	3.85
Sheets, galv., No. 28, P'gh	4.00	4.00	4.00	5.00
Sheets, blue an'l'd, 9 & 10	2.25	2.25	2.25	3.00
Wire nails, Pittsburgh	2.40	2.40	2.40	3.00
Plain wire, Pittsburgh	2.25	2.25	2.15	3.00
Barbed wire, galv., P'gh	3.05	3.05	3.05	3.85
Tin plate, 100-lb. box, P'gh	$4.60	$4.60	$4.75	$7.00
Old Material, Per Gross Ton:				
Carwheels, Chicago	**$16.50**	$15.50	$15.00	$15.00
Carwheels, Philadelphia	16.00	16.00	15.00	18.00
Heavy steel scrap, P'gh	15.00	15.00	13.50	14.00
Heavy steel scrap, Phila.	**12.50**	12.00	12.00	13.00
Heavy steel scrap, Ch'go	**12.50**	11.75	11.25	12.50
No. 1 cast, Pittsburgh	15.75	15.75	16.00	21.00
No. 1 cast, Philadelphia	**17.25**	17.00	16.50	19.00
No. 1 cast, Ch'go (net ton)	**14.25**	13.75	13.00	14.50
No. 1 RR. wrot, Phila.	**15.50**	15.00	14.50	17.00
No. 1 RR. wrot, Ch'go (net)	11.25	11.25	10.50	11.50
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$3.25	$3.25	$2.90	$4.50
Foundry coke, prompt	4.25	4.25	4.00	5.50
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	13.00	13.00	13.25	12.12½
Electrolytic copper, refinery	12.75	12.75	13.00	11.87½
Zinc, St. Louis	**4.65**	4.62½	4.50	4.75
Zinc, New York	**5.00**	4.97½	4.85	5.25
Lead, St. Louis	4.40	4.40	4.40	4.00
Lead, New York	4.70	4.70	4.70	4.00
Tin (Straits), New York	29.00	29.00	30.75	28.00
Antimony (Asiatic), N. Y.	4.20	4.20	4.40	5.25

*The average switching charge for delivery to foundries in the Chicago district is 70c. per ton.
†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

The prices in the above table are for domestic delivery and do not necessarily apply to export business.

Composite Price, March 14, 1922, Finished Steel, 2.019c. Per Lb.

Based on prices of steel bars, beams, tank plates, plain wire, open-hearth rails, black pipe and black sheets

These products constitute 88 per cent of the United States output of finished steel.

Mar. 7, 1922,	1.998c.
Feb. 14, 1922,	2.005c.
Mar. 15, 1921,	2.757c.
10-year pre-war average,	1.689c.

Composite Price, March 14, 1922, Pig Iron, $18.38 Per Gross Ton

Based on average of basic and foundry irons, the basic being Valley quotation, the foundry an average of Chicago Philadelphia and Birmingham

Mar. 7, 1922,	$18.25
Feb. 14, 1922,	18.02
Mar. 15, 1921,	25.38
10-year pre-war average,	15.72

to normal conditions is immediately ahead finds few subscribers.

Increase in the orders for plates, shapes and bars has not been so great as to make it necessary for the mills to advance delivery dates against new business. Improvement in the demand for sheets continues, and there is now a better general operation of the mills than before in several months. Bookings of the American Sheet & Tin Plate Co. last week were the heaviest for any week in about two years. Business in wire products still is good and there has been no let down in the specification for tin plates. There is a livelier market in strips and makers of nuts, bolts and rivets in this district, for the first time in more than a year, are talking more cheerfully about business. Tubular goods prices show a firmer tendency, although some recent business in line pipe is understood to have been placed at very low prices.

The pig iron market is slightly firmer, although not much activity is apparent. The impending strike of union coal miners is attended by very little excitement in the fuel market, but there is a pretty lively situation in scrap iron and steel, due to the efforts of sellers to cover against recent sales.

Of the 140 blast furnaces in this and nearby districts, 62 now are in blast and steel plant operations, taking in both steel works and finishing mills, average between 55 and 60 per cent of capacity.

Pig Iron.—Business does not show much life, but the market shows considerable firmness on all grades and actually has advanced 25c. per ton on basic, of which we note a sale of 1000 tons at $18, Valley furnace. There also has been a sale of 600 tons of this grade at $18 by the Republic Iron & Steel Co., and since both transactions were subject to competition, it is plain that there no longer is any basis for a price of less than $18, Valley furnace. Only small lots of Bessemer iron are being moved by Valley furnaces, but these invariably have been at $19.50, and as far as Valley furnaces are concerned the market is hardly quotable at less. There is a pretty steady demand for foundry iron, but few of the sales are individually large. The market on this

grade is well established at $19 for No. 2. A sanitary ware manufacturer with plants in this district and the South has entered the market for the April requirements for the local plants, amounting to about 2000 tons each of plain No 2 and No. 2X. This interest is reported to have closed for the second quarter requirements of its Southern plant amounting to 9000 tons, at $15, Birmingham, for the base grade.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being $1.96 per gross ton:

Basic	$18.00
Bessemer	19.50
Gray forge	18.75
No. 2 foundry	19.00
No. 3 foundry	18.75
Malleable	19.00

Ferroalloys.—Interest in ferromanganese on the part of steel makers is increasing and while most of the inquiries are for small lots, a few of fair size recently have come out. A Buffalo steel maker is in the market for 1200 tons of 80 per cent material. We note a sale of 500 tons to a Valley steel works and it is currently reported that the Carnegie Steel Co. recently took an order for 2000 tons from a Pittsburgh district independent. This lot is understood to have brought the full quotation of $62.50, seaboard. Commercial producers, however, appear more eager for business and all are not adhering rigidly to that base, except on carload lots. On the basis of recent sales and quotations against large inquiries, the market now is quotable at $60 to $62.50, Atlantic seaboard. An Eastern maker of spiegeleisen has announced quotations of $35, furnace, for 20 per cent material and $30 for 16 to 19 per cent. There has been hardly enough demand lately to provide a real test of these prices. The impression prevails that less can be done on large lots. The market for 50 per cent ferrosilicon is inactive and nominal.

We quote 78 to 82 per cent ferromanganese, $60 to $62.50 c.i.f. Atlantic seaboard for domestic and English. Average 20 per cent spiegeleisen, $35 furnace; 16 to 19 per cent, $30 furnace; 50 per cent ferrosilicon, domestic, $55 to $60 furnace, freight allowed. Bessemer ferrosilicon is quoted f.o.b. Jackson and New Straitsville, Ohio, furnaces as follows: 10 per cent, $36.50; 11 per cent, $39.80; 12 per cent, $43.10; 13 per cent, $47.10; 14 per cent, $52.10; silvery iron, 6 per cent, $25; 7 per cent, $26; 8 per cent, $27.50; 9 per cent, $29.50; 10 per cent, $31.50; 11 per cent, $34; 12 per cent, $36.50. The present freight rate from Jackson and New Straitsville, Ohio, into the Pittsburgh district is $4.06 per gross ton.

Billets, Sheet Bars and Slabs.—Sales of forging billets are fairly numerous, though usually in small lots, the going price being $32, base. Semi-finished steel does not yet reflect the enlargement of finishing mill operations, there being little open market demand for soft billets, slabs or sheet bars. Non-integrated sheet and tin plate makers appear to be covered by contracts for sheet bars. Those equipped to roll billets into bars or slabs into plates or skelp can buy the finished products more cheaply than they can make them. There is no change in prices.

We quote 4 x 4-in. soft Bessemer and open-hearth billets at $28; 2 x 2-in. billets, $29; Bessemer and open-hearth sheet bars, $29; slabs, $28; forging billets, ordinary carbons, $32, all f.o.b. Youngstown or Pittsburgh mills.

Wire Rods.—The market is firm but not especially active as far as domestic users are concerned. Makers generally are quoting $36, Pittsburgh, or Youngstown, for the base size of soft rods and small lots are moving on that basis. Export sales are reported at $35, but this represents an advance since it transpires that business was done as low as $33 a few weeks ago. Prices are given on page 761.

Steel Skelp.—Prices remain indeterminate in the absence of important inquiries and sales. With higher prices quoted on plates, however, an effort is being made to boost the price of skelp and 1.50c. is quoted though 1.40c. is nearer the base of such sales as are made.

Wire Products.—Some uncertainty exists as to the real base of bright and annealed wire and there are rumors that less than $2.40 base per keg is being done on nails. So far as manufacturers in this district are concerned, the market is $2.25 base per 100 lb. for wire and $2.40 base per keg for nails, and these figures are rigidly observed. The doubt about wire prices undoubtedly arises from the fact that when makers authorized the acceptance of nail orders at $2.40, it was assumed by district offices that a like reduction applied on wire, putting the price to $2.15, and business was accepted on that understanding and could not well be repudiated. Reports of price cutting on nails are denied. Business is fairly active but still is below the average of other years at this particular season.

We quote wire nails at $2.40 base per keg, Pittsburgh, and bright basic and Bessemer wire at $2.25 base per 100 lb. Pittsburgh.

Iron and Steel Pipe.—Prices of merchant steel pipe are firmer, as those makers who recently were making special price inducements to secure orders have either withdrawn them or are showing less desire for business at the figures they recently named. Business in this line is steady, but few, if any, of the makers are sold up to a point where there is any question of early deliveries. Oil well goods are moving with a little more freedom and there has been a fair number of line pipe orders. Among the latter was one of 1200 to 1500 tons of 6-in. and 8-in. to a Pittsburgh oil company with wells in West Virginia and in the West; also 28 miles of 6-in. and 26 miles of 8-in. for the Wyoming field, all of this business going to a Valley manufacturer. The market for line pipe still is a buyers' affair. Makers of wrought iron pipe report a steady but not very active demand for merchant pipe. Card discounts are given on page 761.

Sheets.—Continued improvement is noted in the demand for sheets, the feature of which is its diversity. Metal furniture manufacturers lately have been ordering freely and there is an improved demand from the automotive industry, while material for building work is in strong demand. The American Sheet & Tin Plate Co. last week had the largest bookings and specifications of any week in about two years, its business even exceeding that of the week before. This company last week operated 78 per cent of its sheet mills. Independent companies also are getting larger orders and are running between 65 and 70 per cent of capacity. Sheets easily are the most active of the finished products and adherence to quoted prices is more rigid than it has been, not only on black and galvanized, but on blue annealed stock. Prices are given on page 761.

Tin Plate.—Container manufacturers are specifying freely on contracts and there is still a high rate of operation of the mills, this being particularly true of the independent units, which are averaging about 80 per cent. There are few of the independents without a backlog, some not being in a position to take on additional business for shipment before May. This condition finds reflection in a firmer tone to prices. An Eastern maker is understood to have withdrawn some very low prices recently named on Pacific Coast business. The leading interest is running about 65 per cent of capacity and this with 80 per cent by the independents means an average for the entire industry of approximately 75 per cent.

We quote standard production coke tin plate, $4.60 per base box f.o.b. Pittsburgh for carload lots.

Steel Rails.—There has been no special change in light rails, either as to prices or demand. The Carnegie Steel Co. still is quoting 1.45c. base, and is getting a fair run of orders and specifications at that figure. Independents are trying to get the same price, but are not letting orders get away at 1.40c. base. Demand is not very brisk.

We quote 25 to 45-lb. sections, rolled from new steel, 1.40c. base; rolled from old rails, 1.35c. base; standard rails, $40 per gross ton mill for Bessemer and open-hearth sections.

Cold-Finished Steel Bars and Shafting.—The firmer tendency in hot-rolled bars has not yet been reflected in the price of cold-finished bars, which remains at 1.90c. base, and still is being shaded occasionally on orders that are attractive from a rolling standpoint. Business is better than it was earlier in the year and is well diversified. One maker in this district in checking up this month's business in comparison with that of last month and with March of last year, finds that this month shows a gain over February of close to 50 per cent and over that of March last year of more than 300 per cent. In general, however, the trade admits

that there is still room for considerable improvement. Ground shafting holds at 2.25c. base, mill, for carload lots.

Hoops and Bands.—A pretty strong effort is being made to stabilize hoops at 1.90c. base, Pittsburgh, and some business is being booked at that figure, although buyers with desirable orders still are able to place them at $1 to $2 per ton less. The market in bands is not very well defined and while the official quotation is 1.90c. base, Pittsburgh, it is admitted that no business is possible at that figure. Bands appear to be quotable generally at 1.75c. to 1.85c.

Hot-Rolled and Cold-Rolled Strips.—Recent betterment in business is well maintained, the feature of the buying being its diversity rather than the size of the individual orders. Cold-rolled strips are holding well at 3.50c. base, Pittsburgh, and now that the mills have a fair accumulation of orders in hot-rolled strips, there is more disposition to seek prices that will reduce the loss which sales of less than 1.90c. base involve.

Nuts and Bolts.—Orders with makers in this district are more numerous than they have been, but individually they run pretty small and consequently lack volume. Evidently there is not yet enough business to give all a share because concessions from quotations still are reported. Discounts are given on page 761.

Rivets.—Business is better, but the improvement is in the number rather than in the size of the orders. A feature is that demand now is coming from widely scattered sources and no longer is largely confined to tank builders as was the case recently. Leading makers deny having abandoned quotations of $2.25 and $2.35 base, per 100-lb. on heavy rivets, and claim to be getting specifications against contracts for small rivets taken at 70, 10 and 10 per cent off list. On the other hand, it is well established that a few sizable orders for small rivets have attracted an additional 5 per cent on top of the quoted discount of 75 and 10 per cent off list. Some bolt and nut makers have taken orders for certain sizes of rivets as low as $1.90 base, per 100 lb. Prices and discounts are given on page 761.

Spikes and Track Bolts.—Railroads seem to have covered against their early spring requirements and standard spikes now are rather inactive. The Pennsylvania Railroad recently closed for about 500 kegs for the Central Region and for a larger quantity for the Eastern Region. A report that the Chicago, Burlington & Quincy Railroad recently bought a large quantity of spikes is denied. The market on standard spikes in small lots is quoted at $2.10 base, per 100 lb., but on large lots the railroads have been able to negotiate tonnages down to $2 base, per 100 lb. Track bolts still are quoted at $3 base, per 100 lb. in carloads, but the market is rather weak at that price and on less than carloads, business has been done at much less than the usual 1c. per lb. extra over carload lots. Prices are given on page 761.

Iron and Steel Bars.—The effect of the recent advance to 1.50c., base, by most companies has been to crystallize the market, as far as sales are concerned, at around 1.40c. There is no question that the mills allowed regular customers to get under cover prior to the advance, and if there have been any sales at the new quotations, they have involved unimportant tonnages. Makers of iron bars in this district still are holding to 2c. to 2.10c. for refined iron, but note no material improvement in demand.

We quote steel bars rolled from billets at 1.40c. to 1.50c.; reinforcing bars, rolled from billets, 1.40c. to 1.50c. base; reinforcing bars, rolled from old rails, 1.30c. to 1.40c.; refined iron bars, 2c. to 2.10c. in carloads, f.o.b. mill, Pittsburgh.

Structural Material.—Recent advance in price of plain material to 1.50c., base, by most companies is regarded by important fabricating interests as nothing more than an effort to stave off demands for tonnages at 1.30c., base, or less. The claim is made that orders can be placed yet at 1.35c. to 1.40c., and of course there is much tonnage on which the mills have given the fabricating shops protection, at around these prices. There has been a complete dearth of structural awards among the shops here, but inquiries are numerous and hopes still run strong of a good spring business. Prices are given on page 761.

Plates.—The new price of 1.50c. as yet has found little, if any, basis in sales, and as a selling price the present market appears to be quotable at 1.40c. Much business which was pending, however, has been driven in by the advance in asking prices.

We quote sheared plates, ¼ in. and heavier, tank quality, at 1.40c. to 1.50c., f.o.b. Pittsburgh.

Boiler Tubes.—Business in steel tubes steadily is increasing, but there is not yet enough to give all a share and prices remain favorable to buyers. An effort is being made to put prices on a more profitable level, but not much headway yet can be reported. Card discounts are given on page 761.

Coke and Coal.—The market gives little sign of the impending strike of union coal miners. Activity is not of a pronounced sort in either coke or coal and if prices show any definite tendency, it is toward lower rather than higher levels. Spot furnace coke still is quotable at from $3.25 to $3.50 per net ton oven, while spot tonnages of foundry grade are moving at $1 per ton premium over furnace fuel. There have been a few sales of both grades at 25c. per ton above the maximum figure, but lately demand has been a little less insistent for tonnages for stocking and $3.50 for furnace coke and $4.50 for foundry grade have become common maximum. The Lackawanna Steel Co., which recently inquired for 15,000 tons of beehive oven coke a month for second quarter delivery, is reported to have closed at $3.50 per net ton oven. Coal prices are easier within about the recent quotations of $1.50 to $1.75 for mine run steam for prompt shipment; $1.75 to $2 for mine run by-product, and from $2.15 to $2.40 for mine run gas coal.

Old Material.—The market maintains a very firm undertone, although there has been a considerable contraction in buying by melters in the last two weeks. The market gains its strength from the fact that those who took orders a short time ago from the steel mills in this and nearby districts still are endeavoring to cover them and are obliged to offer pretty attractive prices to secure supplies. Offerings of industrial scrap are pretty limited and the railroads at present appear to be providing the bulk of the available supply. Bids of $15 for heavy melting steel have found no response and it is doubtful whether much of this grade to-day could be had at $15.50. The market is stronger on blast furnace material, notably on good clean borings, while machine shop turnings lately have sold as high as $11. The market remains rather dull on the foundry grades.

We quote for delivery to consumers' mills in the Pittsburgh and other districts taking the Pittsburgh freight rate, as follows:

Heavy melting steel, Steubenville, Follansbee, Brackenridge, Monessen, Midland and Pittsburgh	$15.00 to $15.50
No. 1 cast, cupola size	15.75 to 16.25
Rerolling rails, Newark and Cambridge, Ohio; Cumberland, Md.; Huntington, W. Va., and Franklin, Pa.	15.00 to 15.50
Compressed sheet steel	13.00 to 13.50
Bundled sheets, sides and ends	12.00 to 12.50
Railroad knuckles and couplers	15.50 to 16.00
Railroad coil and leaf springs	15.50 to 16.00
Low phosphorus standard bloom and billet ends	17.50 to 18.00
Low phosphorus plates and other grades	17.00 to 17.50
Railroad malleable	13.50 to 14.00
Iron car axles	23.00 to 24.00
Locomotive axles, steel	21.00 to 22.00
Steel car axles	15.50 to 16.00
Cast iron wheels	15.50 to 16.00
Rolled steel wheels	15.50 to 16.00
Machine shop turnings	10.50 to 11.00
Shee' bar crop ends	15.00 to 16.00
Heavy steel axle turnings	12.50 to 13.00
Short shoveling turnings	12.00 to 12.50
Heavy breakable cast	15.00 to 15.50
Stove plate	12.50 to 13.00
Cast iron borings	11.75 to 12.25
No. 1 railroad wrought	12.50 to 13.00

Collecting Fuel Reserves

YOUNGSTOWN, OHIO, March 14.—Steel companies are building up substantial fuel reserves against possible disruption at union coal mines April 1. Interests operating by-product coke ovens are fortifying themselves in particular. Stocks are sufficient for four to six weeks' furnace operation at curtailed rate. Railroads report coal shipments to Valley plants have shown big gains past two weeks.

Chicago

CHICAGO, March 14.

Betterment in mill operation continues to keep pace with the gradual but steady expansion in demands. The Illinois Steel Co. has fired its fifteenth furnace, giving it seven active stacks at Gary, six at South Works and two at Joliet, and it has increased its ingot output to 65 per cent of capacity. Its Gary works is exceptionally busy, being on an 80 per cent operation basis. All of the bar mills at that plant are running double turn for the first time in over a year. The rail mill is producing at the rate of 35,000 tons a month with sufficient bookings to sustain that rate of operation for the rest of the year. The new rail mill of the Inland Steel Co. is also operating, having started last week. This company is also on a satisfactory production basis, with all of its No. 1 plants running double turn and its No. 2 plant single turn. Its steel output is about 60 per cent of ingot capacity.

In keeping with improved bookings, market sentiment is better and prices are steadily growing firmer. Independent mills throughout the country, sick of taking business at a loss, are advancing their prices. While the advance in plates, shapes and bars announced by the Inland Steel Co. last week, has not yet been followed by the local Steel Corporation mill, it would not be surprising if such action would be taken soon, provided market conditions seem to justify it. There is no question that the market on these products has been too low, but it is not yet clear whether the buying movement now in its incipiency has acquired sufficient momentum to sustain an advance.

Much recent buying is directly attributable to the low level of prices. Railroad cars, for example, have been purchased on practically a pre-war basis. On the other hand, it would appear that the railroads themselves anticipate an advance in prices, because they are now trying to close contracts for several months' requirements of such commodities as plates, shapes, bars, tie plates, bolts and spikes. The mills, however, are unwilling to accept such contracts at current prices.

The Republic Iron & Steel Co. to-day announced an advance in bar iron to a minimum of 1.60c., Chicago.

Pig Iron.—Local iron is firm at $20, base, local furnace, and a fair amount of business is being closed at that figure. While most current orders are rather small, a number of contracts for second quarter have been closed, ranging from 100 tons to 2000 tons each. Fairbanks, Morse & Co., which was in the market for 3500 tons of foundry and malleable iron, has closed for 1000 tons at the market. A north Chicago melter has bought 300 tons of Southern foundry at $15 base, Birmingham. Current inquiries include 1000 tons of Northern foundry for Chicago delivery, 1000 tons of Southern foundry for a Michigan melter, and 200 tons of foundry for Indiana shipment. A local melter is in the market for 100 tons of low phosphorous iron and an outside foundry wants 300 tons of the same grade of iron. It is intimated that Jackson County producers will soon announce an advance in silvery iron.

Quotations on Northern foundry, high phosphorus malleable and basic irons are f.o.b. local furnace and do not include a switching charge averaging 70c. per ton. Other prices are for iron delivered at consumers' yards, or when so indicated, f.o.b. furnace other than local.

Lake Superior charcoal, averaging sil. 1.50, delivered at Chicago	$26.00
Northern coke, No. 1, sil. 2.25 to 2.75	20.50
Northern coke, foundry, No. 2, sil. 1.75 to 2.25	20.00
Northern high phos	20.00
Southern foundry, sil. 1.75 to 2.25	$20.77 to 21.67
Malleable, not over 2.25 sil	20.00
Basic	20.00
Low phos., Valley furnace, sil. 1 to 2 per cent copper free	30.00
Silvery, sil. 8 per cent	32.82

Ferroalloys.—A Chicago consumer is in the market for 250 to 500 tons of ferromanganese. This commodity is strong, at least one producer having announced an advance to $65, seaboard. A recent sale of 50 tons of spiegeleisen to a local buyer was closed at approximately the market. Fifty per cent ferrosilicon is inactive and prices are nominal.

We quote 78 to 82 per cent ferromanganese, $70.50, delivered; 50 per cent ferrosilicon, $56 to $57.50, delivered; spiegeleisen, 16 to 18 per cent, $40.10, delivered.

Railroad Equipment.—The New York Central has divided an order for 1000 steel hopper cars equally among the American Car & Foundry Co., the Pressed Steel Car Co., the Standard Steel Car Co. and the Pullman Co. It is intimated that the St. Paul, which is in the market for 1000 box cars, will actually buy 4500 cars. The same road is inquiring for 50 Mikado type locomotives. The Florida East Coast has placed an order for seven Pacific type engines and three switchers with the American Locomotive Co.

Cast Iron Pipe.—Current bookings are satisfactory and prices are firm. Fort Dodge, Iowa, takes bids on 260 tons March 26. The American Cast Iron Pipe Co. is reported to have been awarded 200 tons for Wausau and 150 tons for Madison, Wis.

We quote per net ton, f.o.b. Chicago, as follows: Water pipe, 4-in., $46.10 to $47.10; 6-in. and above, $42.10 to $43.10; class A and gas pipe, $3 extra.

Bars.—Demand for soft steel bars continues to broaden and it is becoming apparent that buying is not solely for replenishment purposes but is also in preparation for seasonal needs. Consumers' stocks, with some notable exceptions, are low and they must be built up to take care of business which will develop in the spring months. Ruling prices remain unchanged, although recent advances by independents here and in the East have given the market a firmer tone. The betterment in demand for steel has not been accompanied by any material increase in bar iron or hard steel bar business. Bar iron mills continue to operate intermittently and no rail-carbon steel bar mill is running better than single turn.

Mill prices are: Mild steel bars, 1.50c. to 1.60c., Chicago; common bar iron, 1.55c. to 1.60c., Chicago; rail carbon, 1.50c., mill or Chicago.

Jobbers quote 2.28c. for steel bars out of warehouse. The warehouse quotation on cold-rolled steel bars and shafting is 3.40c. for rounds and 3.90c. for flats, squares and hexagons. Jobbers quote hard and medium deformed steel bars at 1.90c. base. Hoops, 3.13c. Bands, 2.88c.

Sheets.—There are still evidences of resistance on the part of buyers, but prices remain firm and bookings are gradually increasing. Better tonnages are coming from the automobile industry as well as from other lines. The mills of the Inland Steel Co. are operating at capacity, with 30 days' work ahead.

Mill quotations are 3c. for No. 28 black, 2.25c. for No. 10 blue annealed and 4c. for No. 28 galvanied, all being Pittsburgh prices, subject to a freight rate to Chicago of 38c. per 100 lb.

Jobbers quote: Chicago delivery out of stock, No. 10 blue annealed, 3.38c.; No. 28 black, 4.15c.; No. 28 galvanized, 5.15c.

Wire Products.—Jobbers are buying wire and nails more freely and in some cases are building up stocks for the coming season. There is less contracting ahead than is usually the case at this time of the year, but orders are more numerous and the aggregate bookings of mills larger than a few weeks ago. Demand from jobbers in Middle Western States shows considerable improvement, but business from the Northwest is still light owing to the severe weather conditions there. Prices are firm on finished products, but wire rods are moving at about $33.50, Pittsburgh. For mill prices, see finished iron and steel, f.o.b., Pittsburgh, page 761.

We quote warehouse prices f.o.b. Chicago: No. 9 and heavier black annealed wire, $2.85 per 100 lb.; No. 9 and heavier bright basic wire, $3 per 100 lb.; common wire nails, $3 per 100 lb.; cement coated nails $2.50 per keg.

Warehouse Prices.—Local jobbers have reduced prices on bars, bands, plates, shapes, and rivets. The new quotations are published under appropriate paragraphs.

Rails and Track Supplies.—Demand for track materials remains active, numerous orders for spikes and bolts having been placed. Most of the orders were individually small, a notable exception being 3000 kegs of spikes placed with a local mill by the Southern Pacific. Prices are fairly firm, the lowest quotation reported being 2c., Pittsburgh, which was named on 500 kegs of spikes bought by a Chicago road. Rail specifications are increasingly liberal, but new orders are few. The Chesapeake & Ohio, which was in the mar-

ket for 18,000 tons of rails, has placed 7000 tons with the Gary mill and is understood to have distributed the remainder among other producers.

Standard Bessemer and open-hearth rails, $40; light rails rolled from new steel, 1.50c. to 1.60c., f.o.b. makers' mills.

Standard railroad spikes, 2.05c. to 2.10c., Pittsburgh; track bolts with square nuts, 3.05c. to 3.10c., Pittsburgh; tie plates, steel and iron, 1.65c. to 1.75c., f.o.b. mill; angle bars, 2.40c., f.o.b. mill.

Plates.—The Sinclair Oil Co. has placed an order for 10 additional storage tanks with the Chicago Bridge & Iron Works and also 10 with the Graver Corporation, making a total of 30 tanks, the steel for which, amounting to 9000 tons, will be furnished by the Illinois Steel Co. Specifications received from carbuilders coupled with a steadily increasing number of orders from miscellaneous sources are resulting in more satisfactory mill operations. The price situation remains unchanged, although one local producer is quoting a minimum of 1.60c., mill.

The ruling mill quotations range from 1.50c. to 1.60c., Chicago. Jobbers quote 2.38c. for plates out of stock.

Bolts and Nuts.—Demand is improving slowly and prices, while still weak, continue to grow steadier. Efforts of buyers to close contracts for second quarter at current discounts have proved unsuccessful. Makers who have been willing to take spot business at a loss in order to keep their plants in operation refuse to take on commitments for three months ahead on that basis.

Jobbers quote structural rivets, 3c.; boiler rivets, 3.10c.; machine bolts up to ¾ x 4 in., 60, 10 and 10 per cent off; larger sizes, 60 to 10 off; carriage bolts up to ¾ x 6 in., 60 and 10 off; larger sizes, 55 and 5 off; hot pressed nuts, square and hexagon tapped, $3.75 off; blank nuts, $4 off; coach or lag screws, gimlet points, square heads, 65 and 5 per cent off. Quantity extras are unchanged.

Structural Material.—As the building season approaches, the construction field is becoming more active. New fabricating projects are more numerous and lettings are heavier than for some weeks. Confidence in the successful stabilization of the local labor situation is indicated by the award of the general contract for the London Guarantee Life Assurance Building to the Thompson-Starrett Co. About 4500 tons of fabricated material is involved, which is expected to be let soon. The general contract for the Belden Hotel, another local project involving 4000 tons of steel, is about to be awarded. Plain material prices are unchanged, although they are firmer owing to the fact that one local mill is now quoting a minimum of 1.60c., f.o.b. works. Fabricating awards include:

Indianapolis Athletic Club, 1425 tons, to McClintic-Marshall Co.

Northern Pacific Railroad, bridges for various locations, 2700 tons, to American Bridge Co.

Hotel Rowe, Grand Rapids, Mich., 344 tons, to Rochester Bridge Co. and Vierling Steel Works.

New building for Vienna Model Bakery, Chicago, 166 tons, to Butler Street Foundry Co.

Bucyrus Co., foundry, South Milwaukee, Wis., 250 tons, to Worden-Allen Co.

Bucyrus Co., machine and erecting shop, Evansville, Ind., 250 tons, to Worden-Allen Co.

Jones Island sewage disposal plant, power and boiler houses, Milwaukee, 530 tons, to Milwaukee Bridge Co.

State University of Montana, gymnasium, Missoula, 182 tons, to Minneapolis Steel & Machinery Co.

Pending business includes:

Medical Building, Detroit, 1270 tons, general contract to Bass Construction Co., Cleveland.

Loop Motor Hotel, Chicago, 2000 tons, Glaver & Dinkelberg, architects.

The mill quotation on plain material ranges from 1.50c. to 1.60c. Chicago. Jobbers quote 2.38c. for plain material out of warehouse.

Steel Castings.—No further orders for car castings have been let, but a number involving considerable tonnage are still pending. Outside of castings for railroad cars, there is little business in the market. Prices are holding fairly well, although some isolated instances of cutting are reported.

Old Material.—Some very substantial purchases of heavy melting steel have been made at from $12.50 to $12.75 per gross ton delivered. While this buying is conspicuous because of the tonnage involved, consumptive purchases of other grades are more numerous and have resulted in advances commensurate with the increased strength of the market. Foundry operations are gradually expanding and it is notable that orders for cast grades are more plentiful, although most of them are individually small. Although there has been some recent buying of wrought iron grades, it has now subsided and it is to be noted in this connection that bar iron mill operations are not improving materially, their condition being in marked contrast with that of the steel mills, which have made important gains in output since the first of the year. The bidding of dealers on railroad lists indicates their confidence in a sustained upward swing in prices. Current offerings include the Louisville & Nashville, 10,000 tons, of which 4500 tons is rails, and the Pullman Co., 650 tons. Owing to a typographical error, shoveling steel was quoted last week at $11.25 to $12.75. The quotation should have been $11.25 to $11.75. This grade has since advanced.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton	
Iron rails	$16.00 to	$16.50
Relaying rails	20.00 to	25.00
Cast iron car wheels	16.50 to	17.00
Rolled or forged steel car wheels	14.00 to	14.50
Steel rails, rerolling	13.00 to	13.50
Steel rails, less than 3 ft	13.50 to	13.75
Heavy melting steel	12.50 to	12.75
Frogs, switches and guards cut apart	12.50 to	12.75
Shoveling steel	11.75 to	12.25
Low phos., heavy melting steel	14.00 to	14.50
Drop forge flashings	8.50 to	9.00
Hydraulic compressed sheet	8.50 to	9.00
Axle turnings	8.50 to	9.00
Per Net Ton		
Iron angles and splice bars	14.25 to	14.75
Steel angle bars	11.50 to	12.00
Iron arch bars and transoms	16.00 to	16.50
Iron car axles	20.00 to	20.50
Steel car axles	13.50 to	14.00
No. 1 busheling	9.25 to	9.75
No. 2 busheling	6.25 to	6.75
Cut forge	11.00 to	11.50
Pipes and flues	7.50 to	8.00
No. 1 railroad wrought	11.25 to	11.75
No. 2 railroad wrought	11.00 to	11.50
Steel knuckles and couplers	12.50 to	13.00
Coil springs	13.00 to	13.50
No. 1 machinery cast	14.25 to	14.75
No. 1 railroad cast	13.50 to	14.00
Low phos. punchings	11.50 to	12.00
Locomotive tires, smooth	10.50 to	11.00
Machine shop turnings	5.75 to	6.25
Cast borings	7.00 to	7.50
Stove plate	12.50 to	13.00
Grate bars	11.00 to	11.50
Brake shoes	11.25 to	11.75
Railroad malleable	12.00 to	12.50
Agricultural malleable	12.00 to	12.50

Acquires Stock of the Pittsburgh Rolls Corporation

The Union Steel Casting Co., Pittsburgh, has purchased at private sale a large block of the capital stock of the Pittsburgh Rolls Corporation, Pittsburgh. The plants of both companies are located in the Lawrenceville district of Pittsburgh and it is the intention of the Union Steel Casting Co. in making this purchase that the two plants shall work in close harmony. No changes will be made in the organization or management of the Pittsburgh Rolls Corporation other than the retirement of some directors who have sold their stock and whose places will be filled by officers of the Union Steel Casting Co.

The Pittsburgh Rolls Corporation, (Phoenix Roll Works) has operated in the same locality for more than 50 years. It was first under the name of Bowman, Boyd & Bagley, then James B. Young & Co., and later Seaman, Sleeth & Co., this being the firm name for a number of years prior to 1917, when the Pittsburgh Rolls Corporation succeeded to the business. During these several changes of firm names, the plant has been known as the Phoenix Roll Works, the home of Phoenix rolls, which have had and still are finding wide use not only in rolling mills in this country, but in most parts of the world. Present officers of the company are D. L. Eynon, president, Q. S. Snyder, vice-president and treasurer and P. M. Fleming, secretary.

The Union Steel Casting Co., organized in 1899, has grown from small beginnings to one of the leading steel foundries of the country. Its officers are C. C. Smith, chairman, J. P. Allen, president, J. B. Henry, vice-president and general superintendent, S. H. Church, vice-president, G. W. Eisenbeis, treasurer and W. C. Eichenlaub, secretary.

Philadelphia

PHILADELPHIA, March 14.

Practically all of the independent steel companies have followed the lead of the Jones & Laughlin Steel Co. in announcing a price of 1.50c., Pittsburgh, on plates, shapes and bars. Some of these advances went into effect late last week and others dated from Monday of this week. Buyers were given a few days in which to send in their specifications at the former prices and the result was the booking of a very substantial tonnage in the past week. On specific projects, protection was given for longer periods and the market situation will doubtless be confused during the next week or two by reports that orders are still being taken at the old prices. The independent mills are said to be adhering firmly to 1.50c., Pittsburgh, on all new business, but no orders of any size have been placed at the higher level. It is still possible to buy the heavy tonnage products at 1.40c., Pittsburgh, but apparently all outstanding quotations below the latter figure will be acted upon shortly by buyers, or will be withdrawn by the mills if orders are not forthcoming within a reasonable time.

Pig Iron.—Aside from reported buying by two cast iron pipe companies of about 5000 tons each, there has been no very important pig iron business in the past week. Orders aggregating a few thousand tons additional have been booked, but as a rule do not exceed a few hundred tons each, and specify delivery over the remainder of second quarter. The American Engineering Co. and the Sanitary Co. of America each bought about 1000 tons. No selling for third quarter has been done, so far as reported, but one pipe company has indicated its desire to cover for that period. The uncertainty of the coke situation deters Eastern furnaces from selling so far ahead. The price situation on foundry iron is unchanged. Furnaces are quoting from $19.50 to $20, furnace, on No. 2 plain and 50c. per ton higher on No. 2 X. The furnaces, however, continue to equalize freight rates in competition with sellers having a freight rate advantage. A small tonnage of gray forge has been sold at $19.50, furnace, with $1,26 freight. In other grades of pig iron there is practically no interest, this being particularly true of steelmaking iron. The Alan Wood Iron & Steel Co. will put out its No. 3 furnace this week, leaving only one stack, No. 2, in blast. The Robesonia furnace went out last Saturday on account of lining trouble. The Thomas Iron Co. plans to let Alburtis go out at the end of the month unless the coke situation looks better.

The following quotations are, with the exception of those on low phosphorus iron, for delivery at Philadelphia, and include freight rates varying from 84 cents to $1.54 per gross ton:

East. Pa. No. 2 plain, 1.75 to 2.25 sil.	$20.76 to $20.84
East. Pa. No. 2X, 2.25 to 2.75 sil.	21.26 to 21.34
Virginia No. 2 plain, 1.75 to 2.25 sil.	26.24 to 26.74
Virginia No. 2X, 2.25 to 2.75 sil.	27.24 to 27.74
Basic delivery eastern Pa.	19.84
Gray forge	20.50 to 21.00
Malleable	22.50 to 24.00
Standard low phos. (f.o.b. furnace)	30.00
Copper bearing low phos. (f.o.b. furnace)	28.00

Plates.—The immediate effect of the advance in the plate price to 1.50c., Pittsburgh, by all independent makers has been to create a scramble among buyers to cover to the former prices. A good deal of business was placed in the past week, mostly at 1.35c., Pittsburgh, the mills giving their customers a few days in which to get in their specifications. In the case of specific projects on which fabricators are submitting bids, protection was given for a longer period, but on all new inquiries every maker of plates in the Eastern district is now quoting 1.50c., Pittsburgh. The leading interest, however, has not announced that its price has gone above 1.40c. It may require a week or so to clarify the present price situation, but at the moment the market may be quoted at 1.40c. to 1.50c., Pittsburgh. A number of large plate inquiries are still pending, among which is one coming from several car builders and shipyards which are figuring on the 2000 to 4000 70-ton steel freight cars inquired for by the Norfolk & Western. These cars will require from 22,000 to 44,000 tons of steel. Eastern fabricators are figuring on a steel pipe job for Seattle, Wash., which will require 12,500 tons of plates and a New York State pipe project calls for 2500 tons of plates, but the contract has not yet been awarded. A Philadelphia shipyard, which is bidding on a Great Lakes boat, is asking prices on 1500 tons of plates. The steel for the 47 locomotives to be built by the Baldwin Locomotive Works for the Chicago, Burlington & Quincy Railroad, amounting to 2000 tons, has been placed with the Lukens Steel Co. New locomotive inquiries include one for 50 engines from the Chicago, Milwaukee & St. Paul and one from the Monon for 20. It is reported that other roads will soon be in the market for new power equipment. A disturbing feature in the market is the quantities of salvage plates that are being offered for sale, with prices in some instances as low as 1.20c., Philadelphia.

Structural Material.—Bids are being taken this week on the new Ledger Building, which will require 2000 tons of steel, and on a hotel to be built at Locust and Juniper streets, requiring 1000 tons. Bids close March 24 on a city pier, requiring 4000 tons. Though price protection has been given by the mills on most of the projects on which bids are now going in, 1.50c., Pittsburgh, is being quoted on all new inquiries by the independent mills. The market may be quoted at 1.40c. to 1.50c., Pittsburgh.

Bars.—Many buyers covered their requirements in steel bars at the former prices before the advance by independents to 1.50c., Pittsburgh. Considerable tonnage was booked last week. Bar mills are operating at a fairly good rate on immediate specifications. Bar iron is offered at 1.35c. to 1.40c., Pittsburgh, but there is very little business.

Sheets.—The mills are adhering firmly to 2.25c. on blue annealed, 3c. on black and 4c. on galvanized, f.o.b. Pittsburgh, but concessions, it appears, have been offered by jobbers who apparently have specified heavily against old contracts entered into at prices lower than the mills now quote. These concessions have amounted in some instances to $2 or $3 a ton.

Track Supplies.—The Pennsylvania Railroad has placed about 100,000 tie plates and 5000 kegs of spikes. The Norfolk & Western is expected to release numerous requisitions shortly for bolts, nuts, staybolt iron and other repair material.

Warehouse Business.—Local jobbers have reduced the price on cold rolled steel 25c. per 100 lb.

Old Material.—Eastern scrap dealers have had one of the busiest weeks since 1920, but their orders have come chiefly from the Pittsburgh district, where a good demand exists, particularly for heavy melting steel and blast furnace turnings. On moderate-sized sales to eastern Pennsylvania mills and in line with advances at Pittsburgh, the local market shows many higher quotations this week, averaging about 50c. per ton.

We quote for delivery at consuming points in this district as follows:

No. 1 heavy melting steel	$12.50 to $13.50
Scrap rail	12.50 to 13.50
Steel rails, rerolling	15.00 to 15.50
No. 1 low phos., heavy 0.04 and under	18.00 to 19.00
Cast iron car wheels	16.00 to 16.50
No. 1 railroad wrought	15.50 to 16.00
No. 1 yard wrought	13.00 to 13.50
No. 1 forge fire	10.00 to 10.50
Bundled sheets (for steel works)	10.00 to 10.50
No. 1 busheling	11.50 to 12.50
No. 2 busheling	9.00 to 10.00
Turnings (short shoveling grade for blast furnace use)	10.75 to 11.25
Mixed borings and turnings (for blast furnace use)	10.75 to 11.25
Machine-shop turnings (for rolling mill and steel works use)	11.00 to 11.50
Heavy axle turnings (or equivalent)	11.50 to 12.00
Cast borings (for steel works and rolling mills)	12.00 to 12.50
Cast borings (for chemical plants)	15.00 to 16.00
No. 1 cast	17.25 to 17.75
Railroad grate bars	14.00 to 14.50
Stove plate (for steel plant use)	14.00 to 14.50
Railroad malleable	13.00 to 13.50
Wrought iron and soft steel pipes and tubes (new specifications)	13.00 to 13.50
Shafting	18.00 to 19.00
Iron car axles	No market
Steel car axles	17.00 to 18.50

New York

NEW YORK, March 14.

Pig Iron.—A period of quiet has followed the recent buying, but there is positive evidence that the melt is being slowly increased and numerous sales of small tonnages have been recorded. There has been some selling of charcoal iron on the basis of $22.50 Michigan furnace, or $32.60 New York, a reduction of $7 from the price which prevailed until about two weeks ago. The strike in Brooklyn and Long Island City foundries on account of a reduction of wages of molders from $6.50 for an eight-hour day to $6.00 has been compromised on the basis of $6.25, and the men have resumed work. Letting of the contracts for the segments of the vehicular tunnel is still delayed, but it is regarded as virtually settled that the contracts will be awarded as stated in THE IRON AGE of March 2, page 622.

We quote delivered in the New York district as follows, having added to furnace prices $2.52 freight from eastern Pennsylvania, $5.46 from Buffalo and $6.16 from Virginia:

East. Pa. No. 1 fdy., sil. 2.75 to 3.25	$22.52 to $23.02
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	22.02 to 22.52
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	21.52 to 22.02
Buffalo, sil. 1.75 to 2.25	23.46 to 23.71
No. 2 Virginia, sil. 1.75 to 2.25	28.16

Iron Ore.—Leading eastern furnacemen are not in sympathy with Buffalo furnaces in opposing the proposed reduction by the railroads in the carrying rate on iron ore, but believe that it would be well to allow this reduction to go into effect, so that a similar reduction on coal and coke could be made later. The controversy among various interests connected with the manufacture of iron is considered unfortunate at the present time, adding, as it does, another element of uncertainty to the situation.

Ferroalloys.—The demand for ferromanganese does not increase and inquiries embrace 1000 to 1500 tons, with very few sales reported in the last week. A sale of 100 tons of British alloy is noted. Prices continue firm and unchanged at recent levels. Demand for spiegeleisen is moderately active and fair sales of the lower grades are reported at prevailing quotations. A large producer in New Jersey recently started up a furnace, the output of which is largely booked for some little time. There is no interest in manganese ore and quotations continue nominal. Business in 50 per cent ferrosilicon continues moderate with sales confined to the needs of consumers for fairly early delivery. A middle western consumer is understood to have booked 500 tons at $55, delivered. Quotations follow:

Ferroalloys

Ferromanganese, domestic, seaboard, per ton	$62.50
Ferromanganese, British, seaboard, per ton	$62.50
Spiegeleisen, 16 to 19 per cent, furnace, per ton	$29.00
Spiegeleisen, 20 per cent, furnace, per ton	$30.00
Ferrosilicon, 50 per cent, delivered, per ton	$55.00 to $60.00
Ferrotungsten, per lb. of contained metal	40c. to 50c.
Ferrochromium, 6 to 8 per cent carbon, 60 to 70 per cent Cr., per lb Cr., delivered	12c. to 14c.
Ferrovanadium, per lb. of contained vanadium	$4.00

Ores

Manganese ore, foreign, per unit, seaboard	25c. to 26c.
Tungsten ore, per unit, in 60 per cent concentrates	$2.00 up
Chrome ore, 40 to 45 per cent Cr_2O_3, crude, per net ton, Atlantic seaboard	$20.00 to $25.00
Chrome ore, 45 to 50 per cent Cr_2O_3, crude, per net ton, Atlantic seaboard	$25.00 to $27.00
Molybdenum ore, 85 per cent concentrates, per lb. of MoS_2, New York	50c. to 60c.

Finished Iron and Steel.—Although the Midvale and the Bethlehem companies have joined the Jones & Laughlin Steel Co. in advancing the price of plates, shapes and bars to 1.50c., Pittsburgh, the market is not firmly established at that level. Some companies apparently are still willing to take business at figures lower than 1.50c., though it is predicted in the trade that a more general adoption of the 1.50c. quotation by the mills will become effective this week. Under the present condition it is difficult to tell what the market price is on plates, shapes and bars for the reason that undoubtedly a good part of the business closed within the past week had been quoted upon prior to the advance. The general opinion is that the heavy tonnage products will be stabilized at about 1.40c., Pittsburgh, with a little more firmness in shapes than in plates and bars. It probably will take a week or so, however, to determine just how firmly the mills will stand for higher prices, particularly those mills which have not publicly made known their attitude. The New York, New Haven & Hartford Railroad a few days ago placed 1100 tons of plates, shapes and bars at a price reported to be 1.35c., Pittsburgh, while 1500 tons of deformed bars for a Cuban pier job was bought by a New York contractor at 1.30c., Pittsburgh. The latter transaction is of course regarded as one for export. Plates have been sold within the past few days, even in comparatively small lots, at 1.35c., Pittsburgh, though it is stated that to-day a buyer might find it difficult to place an order at lower than 1.40c. Export prices have stiffened somewhat except in Canada, where plates, shapes and bars have been sold in the past week on the basis of 1.30c., Pittsburgh. Wire products and sheets are firm for domestic trade and have stiffened slightly for export. An effort is being made to hold tin plate at $4.60 per 100 lb. base box, Pittsburgh. Railroad business shows a degree of promise and it is the expectation of car builders that several new inquiries for cars will be sent out within the next few weeks. The New York Central Railroad will receive bids up to March 22 on 3000 tons of plates, shapes, bars, axles, track supplies, etc. The Pennsylvania Railroad has inquired for 250 all-steel passenger cars and the Louisville & Nashville is inquiring for 25 passenger cars. The American Locomotive Co. has received an order from the Florida East Coast Railroad for 10 locomotives. Structural steel work is in fair volume, with new projects showing a slight increase in number. New work includes:

City of Philadelphia pier, 4000 tons, bids closing March 24.

Y. M. C. A. building at Middletown, Ohio, 250 tons.

Hospital at Poughkeepsie, N. Y., 250 tons.

Library at Columbia University, New York, 1600 tons.

Apartment house at West End Avenue and Eighty-eighth Street, New York, 400 tons.

Jobs awarded include the following:

Public library, Philadelphia, 4000 tons, to American Bridge Co.

Boiler plant in Los Angeles, Cal., 750 tons, to a local fabricator.

Residence for Mrs. Alexander Hamilton Rice, Fifth Avenue, New York, 400 tons, to American Bridge Co.

Building for Hudson Trust Co., Hoboken, N. J., 300 tons, to Oltmer Iron Works.

Office building in Boston for Ira G. Hersey & Sons, 1000 tons, to New England Structural Steel Co.

Power house extension at New Bedford, Mass., 400 tons, to McClintic-Marshall Co.

Ten oil tanks for Sinclair Consolidated Oil Corporation, 3000 tons, to Chicago Bridge & Iron Works.

Building for American Car & Foundry Co. at Huntington, W. Va., 600 tons, to American Bridge Co.

Two steel stacks, Brooklyn Edison Co., 400 tons, to Chicago Bridge & Iron Works.

No decision has been announced by the New York Central Railroad on the bridge across the Hudson River at Castleton, N. Y., requiring 23,000 tons of steel. It is reported that the work may be divided between the lowest two bidders. B. Goldberg & Son, 166 Jackson Avenue, Long Island City, N. Y., is in the market for 300 tons of steel sheet piling.

We quote for mill shipments, New York, as follows: Soft steel bars, 1.78c.; plates, 1.78c.; structural shapes, 1.78c.; bar iron, 1.73c. to 1.88c. On export shipments the freight rate is 28.5c. per 100 lb. and the domestic rate is 38c.

Cast-Iron Pipe.—The market continues active, particularly in purchases by private interests. There is also a moderate amount of municipal buying, chiefly on awards to contractors. One of those recently placed, but for which the pipe involved has not yet been purchased, calls for 590 tons of cast-iron pipe. Another tender, which will be opened March 22, by the Department of Water Supply, Gas and Electricity, New York, involves about 800 tons for installation in the Borough of Bronx. On the whole the market is extremely optimistic and prices continue stiff. We quote per net ton, f.o.b. New York, as follows: 6-in. and larger, $47.30; 4-in. and 5-in., $52.30; 3-in., $52.30, with $4 additional for Class A and gas pipe.

High Speed Steel.—The market continues quiet and prices weak. The majority of sales are now being made at about 75c. per lb. for 18 per cent tungsten, high speed steel.

Warehouse Business.—The market is quiet and prices weak. It is generally believed that a downward

revision of prices will be made within the next week or ten days. Activity continues in the brass and copper market, where prices are holding up fairly well except on copper sheets, which are off about ¾c. per lb. Wrought iron and steel pipe is unchanged. We quote prices on page 776.

Coke.—The market is not as active as it was during the recent flurry, but prices are strong, and $4.50 is the prevailing price on foundry grades with some companies asking $4.75 and even more. By-product coke is still quoted at $8.59 delivered to points on the Pennsylvania, Erie and Lackawanna railroads, and $9.15 on the Central of New Jersey.

Old Material.—The slight improvement evident during the past few weeks has suddenly developed into a distinct upward trend. Prices on No. 1 heavy melting steel have advanced to as high as $15.50 per ton in the Pittsburgh district and buying prices in the New York market are from $9 to $9.50 per ton, with some actual transactions reported to figure back to a basis of $9.75 New York. This advance has resulted in some instances in rerolling rails, which are now at about the same price, being sold for heavy melting steel. Despite the evidently favorable outlook, dealers feel that it may be only temporary. The present buying is largely confined to western Pennsylvania mills, those in the East still adhering to a policy of low prices and not seeming to be particularly anxious to buy.

Buying prices per gross ton, New York, follow:

Heavy melting steel, yard	$9.00 to $9.50
Steel rails, short lengths, or equivalent	9.00 to 9.50
Rerolling rails	9.25 to 9.75
Relaying rails, nominal	27.00 to 28.00
Steel car axles	10.00 to 10.50
Iron car axles	17.50 to 18.50
No. 1 railroad wrought	9.50 to 10.00
Wrought iron track	8.50 to 9.00
Forge fire	4.75 to 5.25
No. 1 yard wrought, long	9.00 to 9.50
Cast borings (clean)	7.00 to 7.50
Machine-shop turnings	5.25 to 5.75
Mixed borings and turnings	5.50 to 6.00
Iron and steel pipe (1 in. diam., not under 2 ft. long)	7.75 to 8.25
Stove plate	10.50 to 11.00
Locomotive grate bars	10.00 to 10.50
Malleable cast (railroad)	8.00 to 8.50
Cast-iron car wheels	10.50 to 11.00

Prices which dealers in New York and Brooklyn are quoting to local foundries, per gross ton, follow:

No. 1 machinery cast	$16.50 to $17.00
No. 1 heavy cast (columns, building materials, etc.), cupola size	15.50 to 16.00
No. 1 heavy cast, not cupola size	15.00 to 15.50
No. 2 cast (radiators, cast boilers, etc.)	10.50 to 11.00

Cleveland

CLEVELAND, March 14.

Iron Ore.—Railroads in the central territory have filed with the Interstate Commerce Commission new tariffs making a 20 per cent reduction on ore rates from Lake Erie ports to interior furnaces, the new rates to become effective April 17. The new rates are considerably above the rates that prevailed before the present rates were placed in effect. The Buffalo and other lake front blast furnace interests that have opposed efforts to secure lower rail rates on ore unless a reduction is granted on coal and coke rates, have asked a suspension of the proposed rates. It is believed that a decision will be handed down without delay by the Interstate Commerce Commission which has already spent considerable time in investigating the rate situation in respect to these commodities. With the reduction in rail rates, the railroads also plan to place in effect on the same date a 20 per cent reduction in ore handling charges. The present rail rates, being a flat 40 per cent advance over previous rates, were placed in effect Aug. 26, 1920, a corresponding increase in dock handling charges being made a month later. On Oct. 20 last, a temporary reduction of 28 per cent was made in rail rates on ore to remain in effect until Jan. 1, this bringing rates virtually back to where they were before the 40 per cent advance. In December the railroads agreed to extend the reduced rates until March 31, but the Interstate Commerce Commission refused to grant this extension, evidently as the result of the opposition of the lake front blast furnace interests which claimed that a reduction on ore rates without a reduction on coal and coke rates was a discrimination against them. There is some belief in the ore trade that the railroads will shortly place in effect a temporary reduction in ore rates from the mines to upper lake ports, to remain effective during the season or possibly until the Interstate Commerce Commission hands down its decision in the pending ore rate case. The rates as they existed from 1917 to 1920, the present rates and the new rates, are as follows, the figures showing the line haul rate and not including the dock handling charge:

	New Rate	Present Rate	Rate Previous to 1920
Valley	$0.73	$0.91	$0.65
Dover, Leetonia and New Castle	0.785	0.98	0.70
Midland, Pa.	0.885	1.105	0.79
Pittsburgh	1.02	1.275	0.91
Johnstown	1.15	1.44	1.03
Jackson and Hamilton from Toledo	0.80	1.00	0.715
Jackson from Cleveland	0.995	1.245	0.89
Ironton	1.11	1.385	0.99
Lehigh and Schuylkill Valleys	1.725	2.155	1.54
Sparrows Point	1.78	2.225	1.59

The dock charge for handling direct shipment ore from the rail of the vessel to the car was 6 cents from 1917 to 1920. It is now 8½c. and will be reduced to 7c. The handling charges on dock ore are to be reduced as follows: Handling from vessel to stock pile, from 22½c. to 18c., and from stock pile to car, from 14c. to 11c. The 14c. dock charge for handling from hold to rail of vessel, which is borne by the shipper, is reduced from 14c. to 11c.

The freight reduction on direct shipment ore, including the reductions in the charges for the handling from the vessel, amounts to 21.5c. per ton for the Valley and 30c. for Pittsburgh, or equivalent to 55c. and 60c. reductions, respectively, on the cost of making a ton of pig iron.

We quote delivered lower lake ports: Old range Bessemer, 55 per cent iron, $6.45; Old range non-Bessemer, 51½ per cent iron, $5.70; Mesabi Bessemer, 55 per cent iron, $6.20; Mesabi non-Bessemer, 51½ per cent iron, $5.55.

Pig Iron.—Furnaces are still making a fairly large number of sales of foundry iron, but the volume of business fell off during the week owing to the absence of any large lot orders. The business booked was mostly in lots of 200 tons and under. One lake furnace interest reports sales aggregating over 4,000 tons during the week in small lot orders. An order for 500 tons was placed by a Cleveland manufacturer of printing machinery. The market is fairly firm, the price situation showing virtually no change. Most of the business was booked at $19 for No. 2 foundry iron. No inquiries developed from points regarded as highly competitive, but sellers who have been quoting $18.50 for iron for shipment to points where competition is keen, have shown no disposition to hold out for higher prices for this competitive business. The only inquiry of any size is from a Quincy, Ill., consumer for 1,000 tons of foundry iron for the second quarter. Shipments on contracts continue good and if they hold up at the present rate, March shipments will be larger than during any previous month for a year.

Quotations below are f.o.b. local furnace for Northern foundry iron, not including a 56c. switching charge. Other quotations are delivered Cleveland, being based on a $1.96 freight rate from Valley points, a $3.36 rate from Jackson and a $6.67 rate from Birmingham:

Basic	$19.71
Northern No. 2 fdy., sil. 1.75 to 2.25	$19.00 to 19.50
Southern fdy., sil. 1.75 to 2.25	22.17
Ohio silvery, sil. 8 per cent	30.86
Standard low phos., Valley furnace	32.00

Semi-finished Steel.—A northern Ohio mill has purchased 3000 tons of sheet bars at $29, Youngstown. The market is apparently well established at that price.

Finished Material.—The price advance to 1.50c. in steel bars, plates and structural material by the leading Pittsburgh independent producer has been followed by similar advances by several of the other larger independent mills, but the Carnegie Steel Co. is still quoting the 1.40c. price. Unless the Steel Corporation also advances prices, some of the independent mills are not expected to hold to the 1.50c. base for lots of any size, for independent mills cannot hope to book much business at premium prices of $2 a ton. The Cambria Steel Co. has advanced its price on steel bars, plates and structural material to 1.50c. for car lots and over and to 1.60c. for less than car lots. The stiffening of the market has brought out considerable business at the 1.40c. price from consumers who will stock up to

avoid the possibility of paying higher prices. Quite a number of others have placed contracts for three months' requirements. Some orders have been taken at the 1.50c. price, but these have been for very small lots. The Great Northern Railroad will build a new dock at Superior, Wis., which will require 11,850 tons of steel, including structural material, plates and 800 tons of hard steel bars, and in addition it has an inquiry out for 750 tons of structural material for bridge work. This is the only inquiry that developed for round tonnage during the week. The fabricating contract for the Kresge Building, Cleveland, has been awarded to the Massillon Bridge & Structural Co. Hard steel reinforcing bars are quiet and weak. While the usual quotation is 1.40c., a desirable inquiry will doubtless bring out a lower price.

Sheets.—While the market is generally very firm, offerings are appearing in sheets classed as shop worn at some concession from regular prices. New demand is not active, few sales of over car lots being reported.

Jobbers quote steel bars, 2.36c.; plates and structural shapes, 2.46c.; No. 9 galvanized wire, 3c.; No. 9 annealed wire, 2.50c.; No. 28 black sheets, 3.75c.; No. 28 galvanized sheets, 4.75c.; No. 10 blue annealed sheets, 3.10c.; hoops and bands, 2.96c.; cold-rolled rounds, 3.25c.; flats, squares and hexagons, 3.75c.

Coke.—The demand for coke has quieted down. Most foundries have put in good sized stock to avoid danger of a shortage, should a coal strike interfere with production. Prices are firm, little, if any, Connellsville coke being available under $4.50 per net ton.

Bolts, Nuts and Rivets.—The demand for bolts and nuts continues to gain, although orders are generally for small lots. A local maker has booked three carloads for shipment to England this month. Although there is still some shading of regular quotations, prices are stiffening up somewhat. The demand for rivets has improved, but the largest orders are for car lots. A leading local maker is adhering to 2.10c. to 2.20c. for structural and boiler rivets respectively, but concessions from $1 to $2 a ton are being made.

Old Material.—The demand for heavy melting steel became fairly active during the week. Youngstown, Canton and Warren mills are credited with round lot purchases. As the result, the price on this grade has stiffened. It is understood that mills paid as high as $16 for No. 1 railroad steel. A Pittsburgh dealer is reported to have sold heavy melting steel at $16 for delivery at Denora, is offering that price for this grade delivered at that point, $15.50 for delivery to Monessen and $12 for borings and turnings and $11.50 for busheling for Pittsburgh delivery. There is some activity in compressed steel, which is slightly firmer. There has been no buying by Cleveland mills. Dealers doubt whether the present stiffening of prices will hold.

We quote per gross ton, f.o.b. Cleveland, as follows:

Heavy melting steel	$13.00 to $13.25
Steel rails, under 3 ft	12.75 to 13.25
Steel rails, rerolling	14.50 to 15.00
Iron rails	12.00 to 12.50
Iron car axles	18.00 to 19.00
Low phosphorus melting	13.50 to 14.00
Cast borings	9.00 to 9.25
Machine shop turnings	8.75 to 9.00
Mixed borings and short turnings	8.75 to 9.00
Compressed steel	10.00 to 10.25
Railroad wrought	12.00 to 12.50
Railroad malleable	12.50 to 13.00
Light bundled sheet stampings	7.00 to 8.00
Steel axle turnings	9.50 to 10.00
No. 1 cast	15.00 to 16.00
No. 1 busheling	9.00 to 9.25
Drop forge flashings, over 10 in.	9.00 to 9.25
Drop forge flashings, under 10 in.	9.25 to 9.75
Railroad grate bars	12.75 to 13.00
Stove plate	13.00 to 13.25
Pipes and flues	8.50 to 9.00

British Pig Iron and Steel Output for February

LONDON, ENGLAND, March 14 (*By Cable*).

The production of pig iron in Great Britain in February was 300,100 gross tons and that of steel ingots and castings 415,000 tons. These compare with an output of 288,000 tons of pig iron and of 327,500 tons of steel in January. The February pig iron is the largest since last March. The steel output compares with a monthly average of 403,350 tons for the six months preceding February and following the coal strike.

Cincinnati

CINCINNATI, March 13.

Pig Iron.—Increased activity was noted in the market during the past week. A number of sales of from 100 to 200 tons were negotiated, and from points scattered throughout the territory. Sellers see in these sales the best evidences of returning prosperity, as most of them were booked for immediate shipment, indicating that stocks of foundry yards are at a very low point. A local jobbing foundry bought 100 tons, another 200 tons, and several others single carloads. A central Ohio implement manufacturer was a buyer of 150 tons and a gas engine manufacturer is reported to have taken 300 tons of malleable. A central Ohio manufacturer also placed an order for 400 tons. Stove shops are reported fairly busy, an Indiana melter placing an order for 400 tons, and two stove shops in Michigan inquiring for 500 to 1000 tons each. There is also an inquiry current for 2000 tons from Illinois, 1000 tons of malleable from Chattanooga, and 500 tons of foundry iron from Cleveland. The Standard Sanitary Mfg. Co. is in the market for 1000 tons for Louisville, and there are several inquiries from outside the territory for 100 to 300 tons. Prices show little change as compared with last week, and $15, Birmingham, is now regarded as the Southern market, though several furnaces are holding for $15.50 and $16. Southern Ohio prices remain unchanged at $18.50 to $19, though in places where the furnace has a distinct freight advantage, $19.50 has been done. Chicago iron at $20 has practically been eliminated as a factor in this market.

Based on freight rates of $4.50 from Birmingham and $2.52 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base)	$19.50 to $20.00
Southern coke, sil. 2.25 to 2.75 (No. 2 soft)	20.00 to 20.50
Ohio silvery, 8 per cent sil.	30.02
Southern Ohio coke, sil. 1.75 to 2.25 (No. 2)	21.02 to 21.52
Basic, Northern	21.02
Malleable	21.52 to 22.02

Finished Material.—While it is a little early to note the effects of the price increases made by independent mills on the heavier products, the hope is expressed that there will be a stabilized price condition which will be of great advantage to the steel industry. Some small orders have already been booked at the new prices and considerable business is reported placed before the new prices went into effect. As indicating the trend of events, a number of buyers attempted to place orders for second quarter at the prices recently in effect, but in all cases mills refused to book the business. Price advances by independent mills have had the effect of strengthening the market somewhat on other products and as a result fairly good buying of sheets for second quarter delivery was in evidence during the week. The wire market also is stiffening somewhat and less is heard of shading of prices on nails, which are apparently firm on the basis of $2.40 per keg Pittsburgh. Wire products moved in fair volume and some business was also placed for cold-rolled strips. In the structural field, the announcement of increased prices by independent mills has created somewhat of a stir and one large construction company is understood to have withdrawn all its outstanding bids. Several lettings of importance were noted during the week. The Indianapolis Athletic Club, involving 1450 tons, has been awarded to the McClintic-Marshall Co. and the steel for the Wilde Bank Building, Indianapolis, involving 500 tons, will be fabricated by Hetherington & Berner, Indianapolis. Revised plans will be submitted on the Moose Temple at Hamilton, on which all bids were rejected. Several new projects of importance will shortly come up. The United States Government has plans prepared for a parcel post building to be erected in Cincinnati. This building will be 280 x 300 ft., three stories. Harry Hake of Cincinnati is the architect. The Union Labor Temple Association, Louisville, Ky., has let the contract for the excavation work on the new Labor Temple building to be erected in that city at a cost of $300,000. This building will be a five-story brick and steel structure and will contain, besides offices, an auditorium seating 2000 people. Schenck & Williams,

Dayton, Ohio, will shortly take figures on a 14-story bank building at Ashland, Ky., and plans have been completed for a school building at Cincinnati to cost $250,000. Plant operations are improving. The Newport Rolling Mill Co. will put on two additional sheet mills this week, giving them eight mills in operation. Fires will be lighted in the open-hearth furnaces at the Andrews Steel plant and steel making will commence about March 20. The American Rolling Mill Co. plants at Middletown will continue to operate full time and the Zanesville mills of the same company will be on a 50 per cent basis. At the Ashland plant, operations will continue the same as last week, but it is expected that the sheet mills at this plant will be put on before the end of the month. At Portsmouth, the Whitaker-Glessner Co. will maintain its present rate.

Warehouse Business.—Structural steel and reinforcing bars are moving in fair volume from local warehouses. Jobbers of wire products also report improvement during the week. The nail market shows signs of stiffening. Prices are being fairly well maintained, although it is reported that some shading on cold-rolled products is being done, and it would not be surprising if lower quotations were in effect within the next week.

Tool Steel.—A slight improvement is noticed in the tool steel market and while orders are still small, they are more numerous. Prices show no change, the usual quotations on 18 per cent tungsten high speed steel being 85c. per lb.

Iron and steel bars, 2.75c. base; hoops and bands, 3.35c. base; shapes and plates, 2.85c. base; reinforcing bars, 2.82½c. base; cold rolled rounds, 1½ in. and larger, 3.50c. base; under 1½ in. and flats, squares and hexagons, 4c.; No. 10 blue annealed sheets, 3.60c., No. 28 black sheets, 4.25c.; No. 28 galvanized sheets, 5.25c.; wire nails, $2.75 per keg base; No. 9 annealed wire, $2.60 per 100 lb.

Coke.—The coke market is slowing up somewhat, but prices are holding fairly well. Connellsville coke is firm at $3.50 for furnace and $4.50 for foundry. Wise County is quoted at $5.25 for foundry and New River at $7.50.

Old Material.—The scrap market is showing signs of returning activity, and prices are higher on some grades. A steel plant in this district bought a small tonnage of heavy steel and turnings during the week, and some blast furnace borings and turnings were sold to a furnace in the South. Foundry scrap is in light demand.

We quote dealers' buying prices, f.o.b. cars:

Per Gross Ton		
Bundled sheets	$4.50 to	$5.00
Iron rails	11.50 to	12.00
Relaying rails, 50 lb. and up	24.50 to	25.00
Rerolling steel rails	10.00 to	10.50
Heavy melting steel	9.50 to	10.00
Steel rails for melting	9.50 to	10.00
Car wheels	12.00 to	12.50
Per Net Ton		
No. 1 railroad wrought	9.00 to	9.50
Cast borings	4.00 to	4.50
Steel turnings	3.00 to	3.50
Railroad cast	12.00 to	12.50
No. 1 machinery	14.00 to	14.50
Burnt scrap	7.50 to	8.00
Iron axles	16.00 to	16.50
Locomotive tires (smooth inside)	9.00 to	9.50
Pipes and flues	3.50 to	4.00

Boston

BOSTON, March 14.

Pig Iron.—Fresh weakness has developed in this market as a result of competition between Buffalo and eastern Pennsylvania furnaces. Buffalo iron, which a week ago was believed to be established on a $18.50 furnace base, this week was offered at $18, or $23.46 delivered New England points. At least one eastern Pennsylvania interest met this delivered quotation, which brings the furnace price down to $19.40. Interests which purchased eastern Pennsylvania iron this week claim to have done better than the equivalent of $18 furnace, Buffalo. The actual tonnage available and turned over in this territory was considerably less than during the previous week, which in a large measure explains the keen competition. All eastern Pennsylvania iron sold, however, was not at reduced prices. A Massachusetts foundry bought 100 tons No. 2X at $20.50 furnace or $24.56 delivered, and numerous car lots of No. 2X and No. 1X were taken at $20.50 and $21 furnace, respectively. Other sales for the week include 500 tons No. 2X to a Vermont foundry, 200 tons No. 2X to a Maine stove maker, 200 tons silicon 2.75 to 3.25 to a Connecticut interest, and 100 tons No. 2X to a Providence, R. I., melter, mostly eastern Pennsylvania iron. Deliveries in all but the last instance, which is for immediate, are for second quarter shipment. The situation, insofar as Virginia and Alabama irons are concerned, is unchanged. Sales are limited to an occasional car lot of special analysis for mixture purposes at prices heretofore established in this market.

We quote delivered at common New England points as follows, having added to furnace prices $4.06 freight from eastern Pennsylvania, $5.46 from Buffalo, $6.58 from Virginia and $10.66 from Alabama:

East. Penn., sil. 2.25 to 2.75	$23.06 to	$24.81
East. Penn., sil. 1.75 to 2.25	23.06 to	24.56
Buffalo, sil. 2.25 to 2.75	23.46 to	23.96
Buffalo, sil. 1.75 to 2.25	23.46 to	23.96
Virginia, sil. 2.25 to 2.75		29.58
Virginia, sil. 1.75 to 2.25		29.08
Alabama, sil. 2.25 to 2.75		26.66
Alabama, sil. 1.75 to 2.25		26.16

Finished Material.—Street railway companies have placed orders for girder and T-rails. Sales of the former include 2200 tons to the Boston Elevated Street Railway Co., 1600 tons to the United Electric Railways, 640 tons to Stone & Webster, and 300 tons to the Springfield Street Railway Co. and the Worcester Consolidated Railway. The Boston Elevated Railway also bought approximately 1300 tons T-rails. The Boston & Maine Railroad has closed on 2200 kegs of track bolts, but has not made known its rail requirements. The Turner Construction Co.'s purchase of 700 tons of reinforcing bars is the outstanding feature of a more active market for that product. The McClintic-Marshall Co. is awarded 3500 tons structural steel for a Park Square, Boston, building, 650 tons for a Boston Elevated Railway inspection shop, 500 tons by Stone & Webster for a New Bedford, Mass., power house extension, and 350 tons for a Cranston, R. I., coal pocket. The New England Structural Co. is awarded 500 tons for an office building at the corner of High and Congress streets, Boston, 300 tons for another office building on Kilby Street and 150 tons for a building on Winter Street. Bids have been asked on approximately 700 tons for a Boston restaurant, on 275 tons for a Christian Science Church, Cambridge, Mass., and numerous smaller tonnages. There is a large prospective tonnage overhanging the market, which probably will be closed shortly in view of the advance in mill prices. New York interests have been awarded 450 tons for a local lighting and power plant addition. The Turner Construction Co., Boston, has awarded 350 tons of column cores to the Berlin Construction Co. New England plants of steel companies are increasing operations. Recent shipments from the Wickwire-Spencer Steel Corporation, Worcester, have been larger than at any period since August, 1920.

Warehouse Business.—Local warehouse interests have reduced prices on cold-rolled steel 25c. per 100 lb., on open-hearth spring steel 50c. and have made a slight cut on 3/16 in. plate stock. Otherwise prices remain as heretofore. They report individual orders as continuing small, but more of them, and an increase in daily shipments from stock as contrasted with last month. The market on stove bolts is now 80 per cent discount whereas heretofore it was 70 and 10 per cent. Business in bolts and nuts shows steady but slow expansion. Sheet zinc is down ¼c. per lb. to 9¼c. base.

Coke.—Both the New England Coal & Coke Co., Boston, and the Providence Gas Co., Providence, R. I., continue to report good sized bookings of by-product foundry coke shipping instructions and some new business. In one instance, the producer previously accumulated a reserve stock, consequently with the increased shipments it has not been necessary to increase plant production. The market for both plants' product is $10.15 delivered where the local freight rate does not exceed $3.40 a ton. Practically no Connellsville district by-product foundry coke is coming into New England.

Old Material.—The undertone of the old material market unquestionably is firmer, not so much because of any actual increase in bookings as to an increase

in actual and tentative inquiries from both inside and outside this territory. Certain dealers are quoting No. 1 machinery cast as high as $17.50 to $18 delivered, but a majority are doing perhaps 50c. less. The market on heavy melting steel is 50c. to 75c. higher, with sellers holding off on bids for anything lower. There continues a very good demand for turnings and borings of all kinds, but more especially cast iron chemical borings.

The following prices are for gross ton lots delivered consuming points:

No. 1 machinery	$17.00 to $17.50
No. 2 machinery	15.00 to 15.50
Stove plate	14.50 to 15.00
Railroad malleable	13.00 to 13.50

The following prices are offered per gross ton lots f.o.b. boston rate shipping points:

No. 1 heavy melting steel	$9.00 to $9.25
No. 1 railroad wrought	10.50 to 11.00
No. 1 yard wrought	9.50 to 10.00
Wrought pipe (1 in. in diam., over 2 ft. long)	7.00 to 7.25
Machine shop turnings	5.00 to 5.25
Cast iron borings, rolling mill	8.50 to 9.00
Cast iron borings, chemical	9.00 to 9.50
Blast furnace borings and turnings	5.00 to 5.25
Forged scrap and bundled skeleton	4.00 to 4.50
Street car axles	11.50 to 12.00
Shafting	12.00 to 13.00
Car wheels	11.00 to 11.50
Rerolling rails	9.50 to 10.00

Birmingham

BIRMINGHAM, ALA., March 14.

Pig Iron.—Every feature of the Birmingham iron market gathered strength last week with the exception of price. That remained at $15.50, with $15 admitted as base on large tonnages by at least one operator. Business came in large volume as it had done for two weeks and average tonnages were larger. A Southern stove foundry took 750 tons at $15.50 and numerous lots of 200 to 500 tons were booked in St. Louis territory. One maker, who went out of the market for March on account of oversold condition, reentered during the week for second quarter on the base of $15.50 and immediately made bookings. A Louisville concern took 1000 tons and a St. Louis concern added 500 tons to an order for 1200 tons already placed, the new iron to be principally for April and May delivery. Central Ohio took 100 tons for April delivery and Atlanta ordered several cars for April delivery. One maker said: "We have had the three best weeks in a year consecutively. We have sold more iron week by week than in any like period in the past year. Tonnages of the individual consumer are larger than heretofore." One maker said: "We entered January and February with little or no iron for those months on our books. We came into March with March capacity nearly booked. By the end of the first week in March, we had booked March make and 6000 tons over. That means large stock reduction." One maker has less than 500 tons on yards. Frank H. Crockard, president Woodward Iron Co., said: "The market has broadened remarkably. If the pace maintains, there will be increase in furnace production." Very little iron has been taken by pipe concerns, the bookings being by the general foundry trade.

We quote per gross ton f.o.b. Birmingham district furnaces as follows:

Foundry, silicon 1.75 to 2.25	$15.00 to $15.50
Basic	14.00 to 14.50
Charcoal, warm blast	30.00

Finishing Mills.—The third consecutive week of capacity operations in the open hearth department of the Tennessee company was recorded. The Conners Steel Co. continued the operation of its hoop and band mill. The American Steel & Wire Co. is at about 60 per cent and new wire drawing business is coming in handily. The Gulf States Steel Co. is making about the same schedule as American Steel & Wire Co.

Coal and Coke.—Both coal and coke are in greater demand with production increasing. Each coke maker seems to be waiting for the other to raise base above $5, but none has taken the lead. Furnace resumption and larger takings by railroads feature the increased demand for coal. Bunker business at Pensacola and New Orleans is understood to be picking up.

Old Material.—Cast scrap remains scarce and tends to advance in price, but has not yet done so. Steel has become firmer, but the market price is shaded on large transactions.

We quote per gross ton f.o.b. Birmingham district yards as follows:

Steel rails	$11.00 to $12.00
No. 1 steel	10.00 to 11.00
No. 1 cast	14.00 to 15.00
Car wheels	13.00 to 14.00
Tramcar wheels	12.00 to 13.00
No. 1 wrought	12.00 to 13.00
Stove plate	11.00 to 12.00
Cast iron borings	6.00 to 7.00
Machine shop turnings	6.00 to 7.00

Buffalo

BUFFALO, March 14.

Pig Iron.—While the volume of inquiry is an encouraging sign of better business, the price situation is still unsatisfactory from the selling point of view. The $18 market is still the rule, but some tonnage has been closed at $18.50. Inquiry is scattered and in a total of 6500 tons on which prices were asked from one furnace, the whole was made up of 35 to 40 separate inquiries. About 10,000 tons has been sold and on two sales of 1000 tons each the consideration was $18. An inquiry from a Massachusetts buyer for 1000 tons has not found Buffalo furnaces responsive because of the effort to have this tonnage spread over third and fourth quarter delivery. Nothing has been booked beyond July delivery. The greater portion of inquiry coming to Buffalo furnaces is from Eastern users.

We quote f.o.b. per gross ton Buffalo as follows:

No. 1 foundry, 2.75 to 3.25 sil.	$19.00 to $19.50
No. 2X foundry, 2.25 to 2.75 sil.	18.50 to 19.00
No. 2 plain, 1.75 to 2.25 sil.	18.00 to 18.50
Basic	18.00 to 18.25
Malleable	18.50 to 19.00
Lake Superior charcoal	26.14

Finished Iron and Steel.—Bars, shapes and plates have been more in demand and with wire products and tin plate business materially increased, the situation is more encouraging than in many months. Pipe and sheet business has not improved in the same ratio as other products, but the price of sheets has held without change in the face of stiff competition. Wire nails and barbed wire demand has been especially brisk. The leading bar mill is quoting 1.40c., Pittsburgh, and while no large tonnages have been taken, the run of orders is more satisfactory. The City of Toronto is inquiring for 1000 tons of plates for use in waterworks extension.

Warehouse Business.—Adjustment of warehouse prices in the Chicago district has not had any effect in Buffalo to date.

We quote warehouse prices f.o.b. Buffalo as follows: Structural shapes, 2.65c.; plates, 2.65c.; plates, No. 8 gage, 3.35c.; soft steel bars and shapes, 2.55c.; hoops and bands, 3.15c.; blue annealed sheets, No. 10, 3.40c.; galvanied steel sheets, No. 28, 5.25c.; black sheets, No. 28, 4.25c.; cold-rolled strip steel, 5.90c.; cold-rolled round shafting, 3.40c.

Old Material.—Settlement of a controversy over the purchase of heavy melting steel on a contract made two years ago when the ruling quotation was $28 has brought about an unusual situation in this market. The buyer—a leading bar and billet maker—has settled by splitting the difference between the original consideration and the present market. The contract originally called for 25,000 tons at $28, but when the market dropped below that figure, the buyer declined to accept further delivery. The settlement just reached —$21—will affect the trend of business, as dealers will be more interested in filling this old contract than seeking new business at $13.50. Generally the situation is brighter and before the settlement referred to was agreed upon, some large movements of steel at $13.50 were made.

Pipes and flues	$7.25 to $7.75
No. 1 railroad wrought	11.25 to 11.75
No. 2 railroad wrought	10.75 to 11.25
Steel knuckles and couplers	12.00 to 12.50
Coil springs	12.75 to 13.25
No. 1 machinery cast	13.75 to 14.25
No. 1 railroad cast	13.25 to 13.75
Low phos. punchings	11.00 to 11.50
Locomotive tires, smooth	10.00 to 10.50
Machine shop turnings	5.50 to 6.00
Cast borings	7.00 to 7.50
Stove plate	12.50 to 13.00
Grate bars	10.50 to 11.00
Brake shoes	10.50 to 11.00
Railroad malleable	12.00 to 12.50
Agricultural malleable	12.00 to 12.50

St. Louis

ST. LOUIS, March 14.

Pig Iron.—An increasing demand for pig iron is reported and there is a better feeling in the trade. The number of carload orders is greater, and there also is a disposition among buyers to take on greater quantities. The market for Northern iron is firm at $20, Chicago, and there has been some complaint that even at this price it has been difficult to get prompt shipments of certain grades. The result has been that Southern iron is coming in for a greater call, especially as it commands a lower price delivered in this territory at present. The only producer in this district is now running on basic iron, and its stock of foundry iron is about exhausted; however, it expects to turn back to foundry iron by April 1. Inquiries are coming in now more generally for later delivery. A Western melter wants 1500 to 2000 tons of foundry iron for over the next 60 to 90 days. A Western melter is in the market for 3000 to 5000 tons of basic. An Indiana melter wants 2000 to 3000 tons. An inquiry for 500 to 800 tons of malleable for an Illinois melter, which has been pending for several weeks, is still open. Scattering inquiries of from a carload to 150 tons total about 1500 tons. A few sales were made during the week of Southern iron for water and rail shipment, on the basis of $16, Sheffield, or $19.44 St. Louis.

We quote delivered consumers' yards, St. Louis, as follows, having added to furnace prices $2.80 freight from Chicago and $5.74 from Birmingham:

Northern foundry, sil. 1.75 to 2.25	$22.80
Northern malleable, sil. 1.75 to 2.25	22.80
Basic	22.80
Southern foundry, all rail, sil. 1.75 to 2.25	$20.74 to 21.24
Southern foundry, water and rail, sil. 1.75 to 2.25, f.o.b. St. Louis	19.44

Finished Iron and Steel.—A much improved condition is reported in the markets for finished iron and steel. Plates, shapes and bars are in greater demand, and sheets are beginning to move. The smaller fabricators, who have been buying right along, report a much better business in store fronts, repair work and other lines to which they cater. The larger fabricators are beginning to feel the effects of spring business, and they, too, are buying more freely, the market being at the point where they believe that prices are right. The price of 1.50c., Pittsburgh, established by the Jones & Laughlin and other independents, has not yet been met by the Steel Corporation. The outlook for a revival of building in St. Louis has been made decidedly brighter by the acceptance of a reduction of 15 per cent in the wage scale of the Bridge, Structural and Iron Workers' Union, from $1.25 to $1.06¼ an hour, effective April 1, this being the third union to accept a reduction from the basic wage of $1.25 an hour. The Majestic Theater, Dallas, Tex., will require 450 tons of structural steel, already placed, and 100 tons of reinforcing bars, not yet bought. The Decatur Bridge Co. got the contract for 90 tons of structural steel for two high school buildings at Springfield, Mo., and for 160 tons of steel for the parcel post building in St. Louis. Rolla Wells, receiver for the United Railways, will soon ask the Federal Court for authority to buy 50 new steel cars for the Grand Avenue line at a cost of $10,000 each. Railroad inquiries during the week were few and inconsequential. Warehouse prices are lower, the reductions being made because of the belief that the spread between mill prices and warehouse prices was too great. Demand at warehouses is light.

For stock out of warehouse we quote: Soft steel bars, 2.37½c. per lb; iron bars, 2.37½c.; structural shapes, 2.47½c.; tank plates, 2.47½c.; No. 10 blue annealed sheets, 3.47½c.; No. 28 black sheets, cold rolled, one pass, 4.15c.; cold drawn rounds, shafting and screw stock, 3.50c.; structural rivets, $3.09½ per 100 lb.; boiler rivets, $3.19½; tank rivets, 7/16-in. and smaller, 65 and 5 per cent off list; machine bolts, large, 60-10 per cent; small, 60, 10 and 10 per cent; carriage bolts, large, 55-5 per cent; small, 60 and 10 per cent; lag screws, 65-5 per cent; hot pressed nuts, square or hexagon blank, $4; and tapped, $3.75 off list.

Coke.—Foundry coke is in increasing demand. The majority of foundries are carrying small stocks, barely more than 30 days' supply. Purchasers of all grades are insisting on immediate shipment. There has been some heavier buying in anticipation of a coal strike. Connellsville coke is selling at from $4.50 to $5.

Old Material.—The market for old material continues to improve, and is much stronger, nearly all items being marked up from 50c. to $1 per ton. However, only one large consumer has come into the market, the others contending that the present advance is only a "dealers' boom" and the prices will seek lower levels within the next few weeks. On the other hand, the dealers believe that an upward swing has started, and they feel that the consumers will eventually begin buying at the higher levels. Railroad offerings before the market this week follow: Mobile & Ohio Railroad, 750 tons; United Railways Co., St. Louis, 1500 tons; Wabash Railway, 500 tons; Kansas City Southern Railway, 750 tons; Terminal Railway Association, 1800 tons; St. Louis & San Francisco Railway, 750 tons, and Santa Fe, 1800 tons.

We quote dealers' prices f.o.b. consumers' works, St. Louis industrial district and dealers' yards, as follows:

Per Gross Ton

Old iron rails	$14.00 to $14.50
Steel rails, rerolling	12.50 to 13.00
Steel rails, less than 3 ft	12.50 to 13.00
Relaying rails, standard section	23.00 to 28.00
Cast iron car wheels	15.00 to 15.50
No. 1 heavy railroad melting steel	10.50 to 11.00
No. 1 heavy shoveling steel	10.00 to 10.50
Ordinary shoveling steel	10.00 to 10.50
Frogs, switches and guards, cut apart	10.50 to 11.00
Ordinary bundle sheet	4.50 to 5.00
Cast steel bolsters	11.00 to 11.50

Per Net Ton

Heavy axle and tire turnings	6.50 to 7.00
Iron angle bars	13.00 to 13.50
Steel angle bars	11.00 to 11.50
Iron car axles	18.00 to 18.50
Steel car axles	13.00 to 13.50
Wrought iron arch bars and transoms	15.50 to 16.00
No. 1 railroad wrought	9.50 to 10.00
No. 2 railroad wrought	9.00 to 9.50
Railroad springs	11.00 to 11.50
Steel couplers and knuckles	11.00 to 11.50
Locomotive tires, 42 in. and over, smooth inside	8.50 to 9.00
No. 1 dealers' forge	8.50 to 9.00
Cast iron borings	5.50 to 6.00
No. 1 busheling	8.50 to 9.00
No. 1 boilers cut in sheets and rings	6.00 to 6.50
No. 1 railroad cast	13.50 to 14.00
Stove plate and light cast	12.50 to 13.00
Railroad malleable	10.50 to 11.00
Agricultural malleable	10.50 to 11.00
Pipe and flues	7.50 to 8.00
Heavy railroad sheet and tank	6.00 to 6.50
Light railroad sheet	3.50 to 4.00
Railroad grate bars	10.50 to 11.00
Machine shop turnings	3.00 to 3.50
Country mixed iron	6.50 to 7.00
Uncut railroad mixed	9.50 to 10.00
Horseshoes	9.50 to 10.00
Railroad brake shoes	10.50 to 11.00

San Francisco

SAN FRANCISCO, March 8.

Pig Iron.—While a rather quiet condition prevails on the Coast, there is a little better demand developing, though gradually. Strengthening exchange rates and a firm tendency in ocean freights has played an important part in decreasing the business here in Continental pig iron in favor of domestic material. During the past two weeks or so, it is reported by a large dealer that around 1000 tons has been sold for Gulf shipment, the market being about $28, ex-ship, San Francisco, for 1.75 to 2.25 silicon analysis. As far as can be ascertained, foreign iron is being held for from $30 to approximately $33. One prospect in sight is an inquiry in this market from Oregon for 1000 tons of foundry pig iron. Another from Los Angeles is for 100 tons of basic pig. Otherwise, demand is mainly for small lots.

Coke.—A good business has been done during the fortnight just passed. The regular steady demand has been felt, together with some special inquiry, as from the Southern Pacific Co., which after having placed 600 tons, is again in the market for an additional 600 tons on March 11. Recently there has been some trading for shipment from New Orleans, it being estimated that around 1200 tons has been sold, prices ranging from $18 to about $21, according to grades, ex-ship. Likewise, English coke has been in

demand, Tacoma and Los Angeles each having taken 500 tons, the price approximating $20, ex-ship.

Finished Iron and Steel.—The Coast markets continue to show improvement, although the betterment is coming very gradually. There seems to be a more buoyant sentiment among the trade, which after the lessons of the past, however, is not disposed to expect too much. The opening of spring favors an enlargement of operations, both from private and State sources. Freight rates are still a problem, which undoubtedly is a deterrent influence, but it is hoped a readjustment will soon be reached. Perhaps the best single deal of recent date is the placing of 1000 tons of structural steel to be used on a new structure being erected by the State at Sacramento. The Steel Corporation was lowest bidder. For the erection of a cannery at Sacramento for the California Packing Corporation about 350 tons of steel will be required. The contract has not yet been let. A bank building to be constructed at Sacramento will require a fair tonnage, but this is not determined to date. Much interest is centering in Seattle at present, where a pipe line and paving work is contemplated. It is reported the paving of First Avenue will require $120,000 for steel work. Prices seem to be reasonably steady and generally are unchanged. The Pacific Gas & Electric is in the market for a second hand locomotive.

Cast Iron Pipe.—There is little change in the situation along the Coast, which except for the pipe line job in Seattle is only moderately active. Prices appear steady to firm at around $33, base.

Old Material.—After the heavy buying of the past month, scrap consumers are virtually out of the market, having liberal supplies on hand. There is little indication of greater foundry expansion at this time, which accordingly means a rather limited consumption. Heavy melting steel has developed a certain weakness, prices now ranging around $9, gross ton delivered at mill, or slightly better. Cast iron scrap is quiet at from about $21 to $23.

Improved Demand for Refractories

PITTSBURGH, March 13.—Although the present month began as if it would be a dull one in refractories, the rise in iron and steel plant activities appears to have stimulated the demand and the past few days have been marked by a considerable swelling both in inquiries and sales. Manufacturers still note no tendency on the part of consumers to abandon a policy of covering only actual needs, but the very fact that stocks of refractories at the iron and steel plants have been allowed to get dangerously low and also to become much broken up, means that needs are greater and more urgent. The supply situation appears to be getting slightly stronger, because during the past few months shipments of most kinds of brick have been running somewhat ahead of production and this has resulted in a reduction in the stocks in first hands.

There is not enough business yet to give all makers a share and competition for orders is keen enough to keep prices in buyers' favor. It is established that a price of $28 per 1000 for Pennsylvania silica brick has not entirely disappeared, but most makers are holding to $30 and intimations are heard of a possible advance of $2 per 1000 about April 1. On Pennsylvania high duty fire clay brick $32 per 1000 is more of a minimum quotation than a selling price. Concessions from quotations also are reported on magnesite and chrome brick.

We quote per 1000, f.o.b. works:

	High Duty	Moderate Duty
Fire Clay		
Pennsylvania	$32.00 to $35.00	$30.00 to $32.00
Ohio	30.00 to 35.00	28.00 to 30.00
Kentucky	32.00 to 35.00	30.00 to 32.00
Illinois	32.00 to 35.00	30.00 to 32.00
Missouri	32.00 to 35.00	28.00 to 32.00
Silica Brick		
Pennsylvania		30.00
Chicago	35.00 to 37.00	
Birmingham		40.00
Magnesite Brick		
Standard size per net ton (f.o.b. Baltimore)		53.00
Chrome Brick		
Standard size, per net ton	40.00 to 42.00	

PRICES MORE STEADY

Moderate Improvement in the Youngstown District —Production Increasing

YOUNGSTOWN, March 14.—Less price unsettlement marks the iron and steel situation, following the advance by a number of companies on bars, shapes and plates to a 1.50c. minimum. Buyers, including both jobbers and manufacturing consumers, are placing tonnages with more freedom. Price advances are being talked of in manufacturing circles affecting other lines, but are being held in abeyance until a heavier backlog is built up on makers' books.

Improved sentiment in the steel market has appreciably affected the scrap market. In this district the old materials market is firmly at $15.75 to $16 for heavy melting, while hydraulically compressed sheets command from $13.25 to $13.50. Lighter grades of scrap continue scarce. While there has been a drop in buying by Valley plants, purchases by the National Tube Co. for its Lorain plant and by independents in close competitive territory have maintained scrap prices at these levels.

Furnace interests in the Valleys figure that the 20 per cent freight rate reduction on iron ore from lower lake ports will produce a saving in iron-making costs of between 35c. and 40c. per ton. The reduced rate, granted by the carriers to become effective April 15, will affect both the line haul and dock charges.

Plant schedules in the Mahoning Valley are on a slightly broader basis this week, as compared with last week. The rate of active steel-making capacity remains the same, with 38 of 51 independent furnaces charged. The Carnegie Steel Co. is pouring from 14 open hearths, giving the Valley a total of 52 active units, out of 66. Two additional pipe furnaces have been fired, 10 of 17 being active, four of the Republic Iron & Steel Co. and six of the Youngstown Sheet & Tube Co. Makers report there is somewhat better demand both for line pipe and casing and for merchant stock from jobbing interests.

COAL WAGE CONTROVERSY

Differences as to How Conferences of Employers and Employees Shall Be Held

PITTSBURGH, March 13.—The chief bone of contention in the impending strike of the bituminous coal miners, on April 1, is whether the operators and officials of the United Mine Workers of America shall confer by districts in reaching a wage scale, or, as has been the practice for several years past, for the operators of the so-called central competitive fields to collectively confer with the union officials. Operators in most districts have expressed a willingness to treat with their men in their respective districts on the question of a new scale to replace the present one, which expires by limitation on March 31. The union leaders in some districts have shown a willingness to go along with this idea, but John L. Lewis, president of the United Mine Workers of America, has specifically forbidden such conferences. The operators in Pennsylvania, Ohio, Illinois and Indiana, those States comprising the central competitive fields, favor dealing with their own men and are opposed to a collective bargain, the result of which forms a basis of wages for all union miners in the United States and Canada.

The Pittsburgh Coal Producers' Association, at a meeting last week, again went on record in opposition to a collective conference, but repeated a former offer to confer with the men employed in the mines embraced by the association.

"We will deal with our own men in western Pennsylvania," says a statement issued by the association, "union or non-union, on a working agreement, with the exception of a check-off, but we will not be a party to a scale for Ohio, Indiana and Illinois. The operators of the Pittsburgh district believe that the practice whereby a common scale was set up for Pennsylvania, Ohio, Indiana and Illinois to be economically unsound."

British Iron and Steel Market

Prices Stiffening on Galvanized Sheets, Tin Plate and Coke—Black Sheets Easier—Labor Deadlock Continues

(By Cable)

LONDON, ENGLAND, March 14.

No settlement has yet been reached in the engineering and shipbuilding labor disputes.

Home consumers of pig iron, realizing that lower prices are improbable at present, are showing more interest and forward contracts are being arranged. There is a fair amount of export buying. Hematite is less active and buyers are disinclined to pay the enhanced prices.

Sellers of Bilbao Rubio ore are asking 27s. ($5.80) ex-ship Tees.

Home demand for steel is affected by the industrial upheaval and steel makers will be unable to continue for long unless there is an expansion in the export trade. Prices are firm, with concessions less easily obtainable.

Continental business is quiet. French foundry pig iron is held at £5 5s. to £5 10s. ($22.57 to $23.65) f.o.b. Luxemburg, and Belgian foundry iron may be had at £5 to £5 5s. ($21.50 to $22.57) f.o.b.

French, Belgian and Luxemburg merchant bars are all quoted at £8 to £8 10s. (1.54 to 1.63c. per lb.) f.o.b., for May and June delivery. German merchant bars are held at £8 5s. (1.58c. per lb.) f.o.b., for April and May shipment. French structural beams are obtainable at £7 12½s. to £8 (1.46 to 1.54c. per lb.) f.o.b., for April and May business. Belgian beams are quoted at £7 12½s. to £7 15s. (1.46 to 1.49c. per lb.) f.o.b., for April and May delivery.

German 3/16-in. plates are held at £8 (1.54c. per lb.) f.o.b., for April and May shipment. Belgian 3/16-in. plates are quoted at £8 12½s. to £8 15s. (1.65 to 1.68c. per lb.) f.o.b., for April and May delivery. Belgian sheet bars are obtainable at £6 12½s. to £6 15s. ($28.49 to $29.02) f.o.b., for March shipment. Luxemburg billets are held at £7 ($30.10) f.o.b., for March and April business. Belgian billets are quoted at £6 10s. ($27.95) f.o.b., for March delivery.

Tin plate quotations for forward shipments are slightly harder on increased business. There have been moderate-sized sales to France, Holland, Scandinavia, Germany and the Near East. Wasters are easier; 20 x 14-in. are held at 16¾ to 17s. ($3.60 to $3.65) f.o.b., ex-stock.

There is increased business in galvanized sheets, but no important parcels have been involved. Prices are stiffer. Japan is buying to usual specifications. Black sheets, 6 x 3 ft., 107 lb., are being sold at £15 10s. (2.97c. per lb.) net, f.o.b.

We quote per gross ton, except where otherwise stated, f.o.b. maker's works, with American equivalent figured at $4.30 per £1 as follows:

Durham coke, delivered.	£1	10s.				$6.45	
Cleveland No. 1 foundry	4	15				20.42	
Cleveland No. 3 foundry	4	10				19.35	
Cleveland No. 4 foundry	4	7½				18.81	
Cleveland No. 4 forge...	4	10				19.35	
Cleveland basic	4	10				19.35	
Hematite	7	0*				30.10*	
East Coast mixed.....	5	0	to	5	2½	21.50 to	$22.04
Ferromanganese	15	0	&	14	10*	64.50 &	62.35*
Rails, 60 lb. and up....	8	0	to	9	10	34.40 to	40.85
Billets	7	0	to	7	10	30.10 to	32.25
Sheet and tin plate bars, Welsh	7	0	to	7	7½	30.10 to	31.71
Tin plates, base box....	0	18¾	to	0	19	4.03 to	4.09
						C. per Lb.	
Ship plates	9	5	to	10	10	1.78 to	2.01
Boiler plates	12	10	to	14	0	2.40 to	2.69
Tees	9	10	to	11	0	1.82 to	2.11
Channels	8	15	to	10	5	1.68 to	1.97
Beams	8	10	to	10	0	1.63 to	1.92
Round bars, ¾ to 3 in...	10	10				2.02	
Galvanized sheets, 24 g.	16	0	to	16	5	3.07 to	3.12
Black sheets	12	5	to	12	10	2.35 to	2.40
Steel hoops	12	0	&	12	5*	2.30 &	2.35*
Co'd rolled steel strip, 20 g.	23	10				4.51	

*Export price.

General Conditions Unsatisfactory—Tin Plate Market Slow—The Basset Process

LONDON, ENGLAND, Feb. 22.—The recent marked improvement in gilt-edged securities has given certain quarters "furiously to think," and a good deal is being said about the wonderful improvement in trade which will shortly be seen. On the other side of the picture we have Sir Alfred Mond, the minister of health, openly stating that he has official information from the Master Cutler in Sheffield that his men were giving up their employment in order to draw the dole.

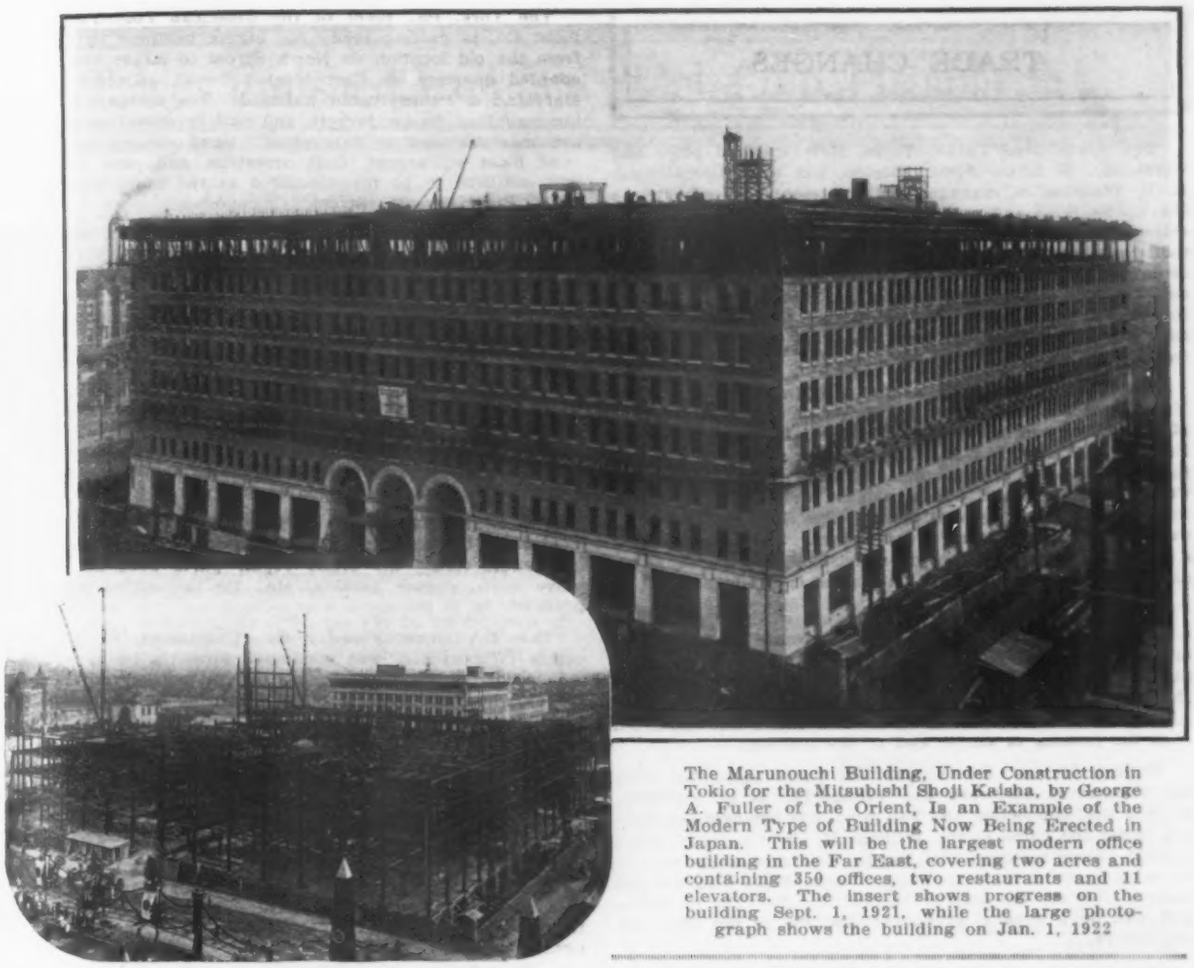
These two illustrations are in direct opposition to each other, but so far as the iron and steel trades are concerned, this country has a long way to go before conditions can approach anything like normal. From information recently received we learn that the shipbuilders have refused their employers' proposal to withdraw the cost of living bonus. High cost of production the slump in merchant shipbuilding and the finish of naval shipbuilding has caused Sir W. G. Armstrong, Whitworth & Co., to close their steel works at Elswick, There has been a considerable demand of late from the continent for coal and coke with the result that prices of these commodities have been advanced, thereby increasing the cost of the manufacture of iron and steel, and it is on account of this that Sir W. G. Armstrong, Whitworth & Co., have had to take this drastic step.

The demand for pig iron is only moderate and, with the position further complicated by increased costs of fuel, makers are naturally undecided as to relighting additional furnaces. There has been a little spurt in buying for export, Italy and Germany taking a few parcels, the latter being shipped to Hamburg but destined, it is stated, ultimately for Czecho-Slovakia. The price of No. 3 Cleveland pig iron is maintained at 90s. for home and export. In the hematite market, dear fuel has already made itself felt, consumers finding that they must now pay more money than they had to do a week ago, it being very hard to obtain supplies of East Coast hematite for less than 97s. 6d. The demand on both home and export account is by no means large, but sufficient to absorb the present rate of output, and the question of putting in additional furnaces is in abeyance while the uncertainty of costs remains.

In the finished iron and steel departments, works are not so keen in taking orders at prices so very much below cost as they have been, while the big makers are rigidly adhering to the prices they have quoted for so many weeks. Works are badly in need of specifications and plants are only working part time. Tin plates are in a bad way, selling prices being far below cost and works are gradually closing down, with the result that output at the present time is certainly no more than 45 per cent. Consumers are only purchasing on a hand-to-mouth scale. A good deal has been heard of American competition in the Far East in tin plates, black sheets, wire and wire nails and latterly galvanized sheets, and there is no doubt that our makers will have to give their very closest attention to this in the future.

Several schemes are being put forward in this country which will directly benefit the iron and steel trades, among them being one involving a sum of £17,000,000 for the electrification of railroads in the south of England. Employment will be found for several thousands of men for a period of four to five years.

Sheffield makers of steel works plant and equipment have been busy on orders for M. Basset, the French metallurgist, who is stated to have discovered a process for making steel direct from iron ore. Part of the plant has been already shipped, consisting of 200-ft. cylinders each 12 ft. in diameter. Each cylinder when lined with firebrick and fully charged weighs about 400 tons. The Sheffield steel makers do not seem to be perturbed to any large extent, pinning their faith on the efficacy of the Siemens open-hearth, electric and crucible furnaces.



The Marunouchi Building, Under Construction in Tokio for the Mitsubishi Shoji Kaisha, by George A. Fuller of the Orient, Is an Example of the Modern Type of Building Now Being Erected in Japan. This will be the largest modern office building in the Far East, covering two acres and containing 350 offices, two restaurants and 11 elevators. The insert shows progress on the building Sept. 1, 1921, while the large photograph shows the building on Jan. 1, 1922

JAPANESE TRADE ACTIVE

Numerous Bar Inquiries—Black Sheet Buying Increases—Rails Active—Large Tin Plate Inquiry

NEW YORK, March 14.—Exports to Far Eastern markets continue to show distinct improvement, and in addition exporters dealing with South America report a considerable increase in inquiries and a few orders from this source. Although inquiries for bars have taken the lead during the past few weeks, but little business is reported closed on this commodity, largely because of the price demands of Japanese buyers. During the past week a slight increase in black sheet inquiries has been registered. One of the large Japanese export houses has been obtaining bids on a tonnage of about 2000 tons of small-sized bars and other exporters are handling inquiries varying from a few hundred tons up to two and three thousand tons. The withdrawal of the foremost independent from a 1.30c. per lb. base on steel bars to higher quotations evidently has not appreciably affected export quotations, as it is reliably reported that sales are still being made to Canadian consumers on a 1.30c. per lb., Pittsburgh base, by other interests.

The Imperial Government Railway tender for about 6500 tons of 60-lb. rails for Japan, similar to the one recently placed in the United States, has been closed but cable information as to the low bidder has not yet been received. Bids have also been submitted on 20 miles of 100-lb. rails, c.i.f. Dairen, Manchuria, for the South Manchuria Railway Co. This tender is also similar to one recently placed in the United States by this company. Bids will be opened March 19. Government buying has also included about 2000 tons of structural steel for bridge construction, which was placed with one of the large Japanese export houses.

Among current inquiries of fairly large size is one calling for about 22,000 base boxes of tin plate.

Recent buying has included light rails, wire, wire nails, black sheets, bars and structural material. One exporter in New York recently sold 200 tons of steel angles obtained from resale lots of the United States Government and is now quoting on an additional 100 tons to the same Japanese buyer. The purchaser requires unused angles but does not object if the material is slightly rusted. Another exporter has booked about 20 miles of 12-lb. rails to a Japanese importer.

Black sheet purchases, it is estimated by conservative Japanese interests, will total annually about 8000 tons for the districts of Tokio and Kobe alone. These estimates are based only on the probable annual consumption of black sheets for fireproofing purposes, necessary because of new municipal ordinances requiring fireproof roofs.

According to a Japanese exporter recently returned from Japan, there is some uneasiness on the part of the more conservative elements at the present increased buying contrasted with the export situation of the country. There has been speculation in iron and steel on a small scale, which has been consistently discouraged by the conservatives and the Government, who fear that unsoundness may again develop in the financial structure of the country.

A joint dinner of engineers, to celebrate the quarter centennial of the Rochester Engineering Society, is to be held in the Powers Hotel, Rochester, Saturday evening, March 19. Members of eight organizations will participate and John R. Freeman will address the meeting on "Engineering Observations In China and the Far East."

After being closed for more than a year, the Stroudsburg, Pa., car shops of the Erie Railroad have reopened on full time. The plant has been leased to the Meadville Machinery Co.

TRADE CHANGES

The South Bend Lathe Works, New England office and warehouse, 65 Oliver Street, Boston, has been discontinued. H. B. Washington, manager, will represent the company in the Middle-West and western Canada. Present plans are to market the company's product through New England machine tool representatives of other lines. This allotting of representatives will be under the supervision of Vernon A. Campbell, heretofore associated with Mr. Washington in the Boston office, not only in New England but in New York State east of Syracuse and in Canada east of Kingston, Ont., as well.

The Traders Steel & Pipe Co. announces that, effective March 1, it has changed its corporate name to the Sawhill-Moreland Co., and has removed its offices from the Conestoga Building to 2529 Oliver Building, Pittsburgh. D. V. Sawhill, formerly in the sales department of the Youngstown Sheet & Tube Co., is president and treasurer, and E. M. Moreland, for a number of years with the Carnegie Steel Co. in a sales capacity, is vice-president and secretary. The company does a general brokerage and merchant business in pig iron, ferroalloys and semi-finished and finished steel products.

The Lakeside Forge Co., Erie, Pa., in addition to its district sales offices in New York at 30 Church Street, in Cleveland at 402 Bangor Building, in Philadelphia at 1218 Chestnut Street, has opened up offices in Detroit at 1354 Penobscot Building and in Indianapolis at 334 North Capitol Avenue. All of these offices are industrial sales offices not connected with the jobbing or dealer end of the business.

William M. Orr, for the past six years associated with the Thomas R. Heyward Co., Pittsburgh, as of March 1, severed that connection and has gone into business for himself under the name of the William M. Orr Co., with offices at 1635 Oliver building, Pittsburgh. The new company will be sales agent in western Pennsylvania, West Virginia and eastern Ohio for the Mueller Metals Co., Port Huron, Mich., and will do a general brokerage business in pig iron and ferroalloys.

The name of the Ball Engine Co., Erie, Pa., has been changed to Erie Steam Shovel Co. This change was made because the company is now making exclusively Erie steam shovels and cranes, the engine business having been sold. Although the manufacture of the steam engines was discontinued about two years ago, it has been necessary to more than triple the plant capacity in the past six years to take care of shovel and crane business. This enlarged plant is now running day and night, with full force on each shift. There has been no change in the assets, policies, management or personnel of the company—the change is in name only.

The Detroit offices of the Whiting Corporation, formerly the Whiting Foundry Equipment Co. of Harvey, Ill., have been changed from 570 Penobscot Building to 3000 Grand River Avenue.

The Detroit offices of the American Brass Co. have been moved from 435 Book Building to 3-113 General Motors Building. Charles F. Craig is Detroit agent of the company.

The Utility Compressor Co., which has maintained offices in Detroit and plant at Adrian, Mich., has moved its general offices to Adrian.

The National Spring & Wire Co. has moved its general offices from Albion, Mich., to Detroit.

The S. L. Jackson Co., Detroit, has taken over the Auto Trimmers Supply and the Iron Products Co., both of Detroit, and both Michigan corporations. The company deals in upholstery and top materials, bolts, screws, nuts, etc.

Theodore Geissmann & Co., McCormick Building, Chicago, has been appointed district sales representative the Standard Seamless Tube Co., Ambridge, Pa.

The Betts Machine Co., Rochester, N. Y., has closed its New York sales office at 50 Church Street, but has not yet announced its plans for representation in the New York district.

The Dale Machinery Co., dealer in machine tools, has moved from 53 Lafayette Street, New York, to the National City Building, 17 East Forty-second Street, New York. A warehouse has been leased at 255 Pearl Street.

The address of the St. Louis office of Stewart Industrial Furnaces has been changed from the Railway Exchange Building to 420 Wainwright Building.

The York, Pa., plant of the American Foundry Equipment Co. is getting ready for bigger business by moving from the old location on North Street to larger and better adapted quarters on East Market Street, adjacent to the Maryland & Pennsylvania Railroad. The company's molding machines, flasks, jackets, and pattern mounting sundries are manufactured at this plant. Sand cutting machines, sand blast equipment, dust arresters, and core machines will continue to be manufactured at the main plant, 2935 West Forty-seventh Street, Chicago.

Ralph M. Sitterley, foreign sales manager, 149 Broadway (Singer Building), New York, announces the establishment of his offices at 149 Broadway, where he will act as foreign sales manager of American manufacturers of electrical specialties, marine supplies, automotive products and equipment. He expects to leave for Europe in April.

Plans of New Companies

The Conemaugh Iron Works, Latrobe, Pa., is a reorganization of the Blairsville Iron Works Co. The products are ingot molds and cast iron enamel ware.

The Brake Equipment & Supply Co., 80 East Jackson Boulevard, Chicago, has been incorporated for the purpose of manufacturing air brake repair parts such as valves, valve seats, copper gaskets, etc., for locomotive air compressors.

The T-A Brass Foundry Co., Charleston, W. Va., recently incorporated, was conducted formerly on a partnership basis. It is now putting on the market a patented trolley wheel equipped with roller bearing and an oil cellar that carries enough oil to run about ten days. The company will be in the market at various times for copper, tin and zinc.

The Arrow Mfg. Co., Harrisburg, Pa., will manufacture electrical and mechanical equipment for automotive service. The work will be done by contract. Contracts have not yet been awarded.

The Eclipse Auto Signal Co., Inc., Cedar Springs, Mich., is having electric automobile direction signals manufactured by contract, and will continue to do so until some time in the early fall.

The Ray P. Farrington Co., Philadelphia, acts as selling agent in the Philadelphia territory for Follansbee Brothers Co., Pittsburgh; the Falcon Steel Co., Niles, Ohio, and the Falcon Tin Plate Co., Canton, Ohio. R. P. Farrington, president, was formerly the district representative of the Trumbull Steel Co., later acted in that capacity for the Falcon Steel Co. and the Newton Steel Co. and, about the first of the year, was appointed representative for Follansbee Brothers Co. and the Falcon Tin Plate Co., having given up the agency of the Newton Steel Co. about a year ago. W. W. Keefer, 2nd, secretary and treasurer, was formerly connected with the Midvale Steel Co., later was with the Tacony Steel Co. in the capacity of special agent and was for two years the sales manager of the Mid-West territory with offices in Cleveland. The company handles a number of sheet and tin mill specialties which, with its tonnage lines, cover practically the whole range of sheet and tin plate manufacture.

The Bethlehem Steel Co.'s New York sales offices have been removed from 111 Broadway to the Cunard Building, 25 Broadway.

The Rochester Terminal & Canal Corporation, Rochester, N. Y., has been incorporated and has acquired dockage and storage facilities on the New York State barge canal. It will engage in the transportation of bulk commodities on the barge canal. A warehouse will be built at Rochester to be equipped with conveyors, coal chutes and other loading machinery. An order has been placed with the Kingston Dry Dock & Construction Co. for 10 barges of 500 tons capacity each. Additional barges will be built as the volume of business increases.

The Crescent Truck Co., recently organized, will locate at Lebanon, Pa., on property of the Hunsicker Engineering Co. The two concerns are independent and the Hunsicker Engineering Co. continues to do business as in the past, as engineer, founder and machinist, manufacturing cars, forgings and special machinery.

The Graton & Knight Mfg. Co., Worcester, Mass., belting, is now operating full time and employing 900.

The Liddell Electric Mfg. Co., Bridgeport, Conn., has received orders for radio apparatus aggregating $100,000.

The Lehigh Valley Coal Co., Hazelton, Pa., has plans in preparation for the construction of a new coal washery at its properties between Jeansville and Beaver Meadow.

Prices Finished Iron and Steel, f.o.b. Pittsburgh

Freight Rates

Freight rates from Pittsburgh on finished iron and steel products, in carload lots, to points named, per 100 lb., are as follows:

Philadelphia, domestic	$0.36	Kansas City	$0.815
Philadelphia, export	0.265	Kansas City (pipe)	0.77
Baltimore, domestic	0.35	St. Paul	0.665
Baltimore, export	0.255	Omaha	0.815
New York, domestic	0.38	Omaha (pipe)	0.77
New York, export	0.285	Denver	1.35
Boston, domestic	0.405	Denver (wire products)	1.415
Boston, export	0.285	Pacific Coast	1.665
Buffalo	0.295	Pacific Coast, ship plates	1.335
Cleveland	0.24	Birmingham	0.765
Detroit	0.325	Jacksonville, all rail	0.555
Cincinnati	0.325	Jacksonville, rail and water	0.46
Indianapolis	0.345	New Orleans	0.515
Chicago	0.38		
St. Louis	0.475		

The minimum carload to most of the foregoing points is 26,000 lb. To Denver the minimum loading is 40,000 lb., while to the Pacific Coast on all iron and steel products, except structural material, the minimum is 80,000 lb. On the latter item the rate applies to a minimum of 50,000 lb., and there is an extra charge of 9c. per 100 lb. on carloads of a minimum of 40,000 lb. On shipments of wrought iron and steel pipe to Kansas City, St. Paul, Omaha and Denver the minimum carload is 46,000 lb. On iron and steel items not noted above the rates vary somewhat and are given in detail in the regular railroad tariffs.

Rates from Atlantic Coast ports (i.e., New York, Philadelphia and Baltimore) to Pacific Coast ports of call on most steamship lines, via the Panama Canal, are as follows: Pig iron, 55c.; ship plates, 75c.; ingot and muck bars, structural steel, common wire products, including cut or wire nails, spikes and wire hoops, 75c.; sheets and tin plates, 60c. to 75c.; rods, wire rope, cable and strands, $1; wire fencing, netting and stretcher, 75c.; pipe, not over 8 in. in diameter, 75c.; over 8 in. in diameter, 2½c. per in. or fraction thereof additional. All prices per 100 lb. in carload lots, minimum 40,000 lb.

Structural Material

I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in., on one or both legs, ¼ in. thick and over, and zees, structural sizes, 1.40c. to 1.50c.

Sheared plates, ¼ in. and heavier, tank quality, 1.40c. to 1.50c.

Wire Products

Wire nails, $2.40 base per keg; galvanized, 1 in. and longer, including large-head barbed roofing nails, taking an advance over this price of $1.25 and shorter than 1 in., $1.75; bright Bessemer and basic wire, $2.25 per 100 lb.; annealed fence wire, Nos. 6 to 9, $2.25; galvanized wire, $2.75; galvanized barbed wire, $3.05; galvanized fence staples, $3.05; painted barbed wire, $2.55; polished fence staples, $2.55; cement-coated nails, per count keg, $1.90; these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days, net, less 2 per cent off for cash in 10 days. Discounts on woven-wire fencing are 70½ per cent off list for carload lots; 69½ per cent for 1000-rod lots, and 68½ per cent for small lots, f.o.b. Pittsburgh.

Bolts and Nuts

Machine bolts, small, rolled threads, 70, 10 and 10 per cent off list
Machine bolts, small, cut threads....70 and 10 per cent off list
Machine bolts, larger and longer....70 and 10 per cent off list
Carriage bolts, ⅜ in. x 6 in.:
Smaller and shorter rolled threads.70 and 10 per cent off list
Cut threads ....70 per cent off list
Longer and larger sizes....70 per cent off list
Lag bolts ....70, 10 and 5 per cent off list
Plow bolts, Nos. 1, 2 and 3 heads....60 and 10 per cent off list
Other style heads....20 per cent extra
Machine bolts, c.p.c. and t. nuts, ⅜ in. x 4 in.:
Smaller and shorter....65, 10 and 5 per cent off list
Larger and longer sizes....65 and 10 per cent off list
Hot pressed sq. or hex. blank nuts....$5.50 off list
Hot pressed nuts, tapped....$5.25 off list
C.p.c. and t. sq. or hex. blank nuts....$5.25 off list
C.p.c. and t. sq. or hex. blank nuts, tapped....$5.00 off list
Semi-finished hex. nuts:
⅛ in. to 9/16 in. inclusive..80, 10, 10 and 10 per cent off list
Small sizes S. A. E....80 and 10 per cent off list
⅝ in. to 1 in. inclusive, U. S. S. and S. A. E., 70, 10, 10 and 10 per cent off list
Stove bolts in packages....80 and 3 tens and 5 per cent off list
Stove bolts in bulk....80, 3 tens and 2½ per cent off list
Tire bolts ....70, 10 and 5 per cent off list
Track bolts, carloads....3c. base
Track bolts, less than carloads....3.75c. to 4c. base

Upset and Hex. Head Cap Screws

½ in. and under....80 and 10 to 80, 10 and 10 per cent off list
9/16 in. to ¾ in....80 and 10 to 80, 10 and 10 per cent off list

Upset Set Screws

½ in. and under....80, 10 and 5 to 85 per cent off list
9/16 in. to ¾ in....80, 10 and 5 to 85 per cent off list

Milled Square and Hex. Cap Screws

All sizes ....75 and 10 to 80 per cent off list

Milled Set Screws

All sizes ....70, 10 and 10 per cent off list

Rivets

Large structural and ship rivets....$2.00 to $2.10
Large boiler rivets.... 2.10 to 2.20
Small rivets ....75 and 10 off list

Wire Rods

No. 5 common basic or Bessemer rods to domestic consumers, $36; chain rods, $36; screw stock rods, $41; rivet and bolt rods and other rods of that character, $36; high carbon rods, $43 to $46, depending on carbons.

Railroad Spikes and Track Bolts

Railroad spikes, 9/16-in. and larger, $2 to $2.10 base per 100 lb. in lots of 200 kegs of 200 lb. each or more; spikes, ½-in., ⅝-in. and 7/16-in., $2.15 to $2.25 base; 5/16-in., $2.15 to $2.25 base. Boat and barge spikes, $2.15 to $2.25 base per 100 lb. in carload lots of 200 kegs or more, f.o.b. Pittsburgh. Track bolts, 3c. base per 100 lb. Tie plates, $1.75 per 100 lb. Angle bars, $2.40 per 100 lb.

Terne Plates

Prices of terne plates are as follows: 8-lb. coating, 200 lb., $9.30 per package; 8-lb. coating, I. C., $9.60; 15-lb. coating, I. C., $11.80; 20-lb. coating, I. C., $13; 25-lb. coating, I. C., $14.25; 30-lb. coating, I. C., $15.25; 35-lb. coating, I. C., $16.25; 40-lb. coating, I. C., $17.25 per package, all f.o.b. Pittsburgh, freight added to point of delivery.

Iron and Steel Bars

Steel bars, 1.40c. to 1.50c. from mill. Refined bar iron, 2c. to 2.10c.

Welded Pipe

The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛	54½	28	⅛ to ⅜	+ 3½	+22½
¼ to ⅜	60	33½	½	36½	18½
½	65	50½	¾	42½	27½
¾	69	56½	1 to 1½	44½	29½
1 to 3	71	58½			

Lap Weld

2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 6	42½	29½
7 to 8	65	51½	7 to 12	40½	27½
9 to 12	64	50½			

Butt Weld, extra strong, plain ends

¼	50½	33	⅛ to ⅜	+ 4½	+37½
¼ to ⅜	56	38½	½	35½	23½
½	62	50½	¾	42½	28½
¾	67	55½	1 to 1½	44½	30½
1 to 1½	69	57½			
2 to 3	70	58½			

Lap Weld, extra strong, plain ends

2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

To the large jobbing trade the above discounts are increased by one point, with supplementary discounts of 5 and 2½ per cent.

Boiler Tubes

The following are the discounts for carload lots f.o.b. Pittsburgh:

Lap Welded Steel		*Charcoal Iron*	
1¾ in.	26½	1½ in.	5
2 to 2½ in.	41	1¾ to 1⅞ in.	15
2½ to 3 in.	52	2 to 2¼ in.	25
3¼ to 13 in.	57	2½ to 3 in.	30
		3¼ to 4½ in.	32

To large buyers of steel tubes, a supplementary discount of 5 per cent is allowed.

Standard Commercial Seamless Boiler Tubes

New discounts have been adopted on standard commercial seamless boiler tubes, but manufacturers are not yet ready to announce them for publication, and for that reason we publish no discounts this week.

Sheets

Prices for mill shipments on sheets of standard gage in carloads, f.o.b. Pittsburgh, follow:

Blue Annealed

Cents per Lb.		Cents per Lb.	
No. 8 and heavier	2.20	Nos. 11 and 12	2.30
Nos. 9 and 10 (base)	2.25	Nos. 13 and 14	2.35
		Nos. 15 and 16	2.45

Box Annealed, One Pass Cold Rolled

Cents per Lb.		Cents per Lb.	
Nos. 17 to 21	2.80	No. 28 (base)	3.00
Nos. 22 to 24	2.85	No. 29	3.10
Nos. 25 and 26	2.90	No. 30	3.20
No. 27	2.95		

Galvanized

Cents per Lb.		Cents per Lb.	
Nos. 10 and 11	3.00	Nos. 25 and 26	3.70
Nos. 12 to 14	3.10	No. 27	3.85
Nos. 15 and 16	3.25	No. 28 (base)	4.00
Nos. 17 to 21	3.40	No. 29	4.25
Nos. 22 to 24	3.55	No. 30	4.50

Tin-Mill Black Plate

Cents per Lb.		Cents per Lb.	
Nos. 15 and 16	2.80	No. 28 (base)	3.00
Nos. 17 to 21	2.85	No. 29	3.05
Nos. 22 to 24	2.90	No. 30	3.05
Nos. 25 to 27	2.95	Nos. 30½ and 31	3.10

Production of Pig Iron in the United States in 1921

THE special statistical bulletin of the American Iron and Steel Institute giving production of pig iron for the past year shows a decided decrease in all grades and the most striking change is in charcoal iron, the production having fallen from 323,396 tons in 1920 to 94,730 tons, a decrease of 70.7 per cent as compared with a decrease of 54.8 per cent of all pig iron. Looking at the production by States, the Indiana-Michigan territory makes the best showing, evidently due largely to the greater activity at Gary, the decrease in this district being 35.58 per cent. The great States of Pennsylvania, Ohio and Illinois did fairly well with decreases ranging from 50 to 55 per cent, and Alabama a trifle below 50 per cent. But the other Southern States, including the border State of Maryland, made a very poor showing, ranging from a decrease of 93.12 per cent in Tennessee to 71.9 per cent in Maryland. The Eastern territory also made a poor showing. Of the leading grades of pig iron the largest decrease was in malleable, 65.11 per cent, while the steel making grades made a somewhat better showing.

Of the total production, 16,688,126 tons, 9,530,981 was produced in the first half and 7,157,145 in the second half year. The production of charcoal pig iron in the second half was only 24,795 tons, or 0.35 per cent of the total iron.

PRODUCTION OF PIG IRON BY GRADES, 1906–1921.

Years.	Basic.	Bessemer.	Foundry.	Malleable.	Forge.	All other.	Total. Gross tons.
1906.	5,018,674	13,840,518	4,773,011	699,701	597,420	377,867	25,307,191
1907.	5,375,219	13,231,620	5,151,209	920,290	683,167	419,856	25,781,361
1908.	4,010,144	7,216,976	3,637,622	414,957	457,164	199,155	15,936,018
1909.	8,250,225	10,557,370	5,322,415	658,048	725,624	281,789	25,795,471
1910.	9,084,608	11,245,642	5,260,447	843,123	564 157	305,590	27,303,567
1911.	8,520,020	9,409,303	4,468,940	612,533	408,841	229,910	23,649,547
1912.	11,417,886	11,664,015	5,073,873	825,643	469,183	276,337	29,726,937
1913.	12,536,693	11,590,113	5,220,343	993,736	324,407	300,860	30,966,152
1914.	9,670,687	7,859,127	4,533,254	671,771	361,651	235,754	23,332,244
1915.	13,093,214	10,523,306	4,843,899	829,921	316,214	309,659	29,916,213
1916.	17,684,087	14,422,457	5,553,644	921,486	348,344	504,779	39,434,797
1917.	17,671,662	13,714,732	5,328,258	1,015,579	345,707	545,278	38,621,216
1918.	18,646,174	13,024,966	5,145,260	1,117,914	393,932	726,398	39,054,644
1919.	14,494,131	9,975,934	4,916,758	1,009,049	271,286	348,206	31,015,364
1920.	16,737,722	12,062,084	5,957,782	1,310,951	318,048	539,400	36,925,987
1921.	7,753,071	5,595,215	2,568,136	457,340	112,748	201,616	16,688,126

PIG IRON MADE FOR SALE OR FOR USE OF MAKERS IN 1921.

Grade.	For sale.	For maker's use.	Total. Gross tons.
Basic	568,843	7,184,228	7,753,071
Bessemer and low-phosphorus	406,045	5,189,170	5,595,215
Foundry, including ferro-silicon	2,316,839	251,297	2,568,136
Malleable	350,682	106,658	457,340
Forge or mill	35,052	77,696	112,748
Ferro-manganese	24,253	79,502	103,755
Spiegeleisen	5,745	50,678	56,423
All other grades	20,560	20,878	41,438
Total Gross tons.	3,728,019	12,960,107	16,688,126

PRODUCTION OF PIG IRON BY STATES, 1917–1921.

States.	1917.	1918.	1919.	1920.	1921.
Maine, Mass., Conn.	10,527	12,485	13,678	10,281	2,142
New York, New Jersey	2,417,527	2,871,118	2,070,288	2,601,134	968,660
Pennsylvania	15,539,728	15,198,271	12,276,585	13,983,134	6,252,766
Maryland	422,212	373,817	244,002	523,733	147,189
Virginia	520,311	513,737	319,409	429,302	67,239
Alabama	2,953,705	2,587,852	2,130,092	2,392,962	1,207,408
W. Va., Ga., Ky., Texas	561,951	594,675	413,091	772,379	264,759
Tennessee	369,951	369,822	190,514	283,207	19,479
Ohio	8,518,603	8,764,132	7,102,627	8,533,470	3,799,613
Illinois	3,456,915	3,440,307	2,558,213	3,280,875	1,612,033
Indiana, Michigan	2,657,503	3,073,599	2,715,659	2,939,521	1,893,611
Wisconsin, Minnesota	738,541	750,366	605,619	711,405	226,863
Mo., Iowa, Col., Mont., Wash., Oregon, Cal.	453,742	504,463	375,587	464,584	226,364
Total Gross tons.	38,621,216	39,054,644	31,015,364	36,925,987	16,688,126

PRODUCTION OF PIG IRON BY STATES, 1920-1921.

States.	Production—Gross tons.					
	1921.	Per cent.	1920.	Per cent.	Decrease.	Per cent. decrease.
Pennsylvania	6,252,766	37.47	13,983,134	37.87	7,730,368	55.28
Ohio	3,799,613	22.77	8,533,470	23.11	4,733,857	55.47
Ind., Mich.	1,893,611	11.35	2,939,521	7.96	1,045,910	35.58
Illinois	1,612,033	9.66	3,280,875	8.88	1,668,842	50.87
Alabama	1,207,408	7.23	2,392,962	6.48	1,185,554	49.54
N. Y., N. J.	968,660	5.80	2,601,134	7.04	1,632,474	62.76
W. Va., Ky.	264,759	1.59	772,379	2.09	507,620	65.72
Wis., Minn.	226,863	1.36	711,405	1.93	484,542	68.11
Mo., Iowa, Colo., Mont., Wash.	226,364	1.36	464,584	1.26	238,220	51.28
Maryland	147,189	.88	523,733	1.42	376,544	71.90
Virginia	67,239	.40	429,302	1.16	362,063	84.34
Tennessee	19,479	.12	283,207	.77	263,728	93.12
Maine, Mass., Conn.	2,142	.01	10,281	.03	8,139	79.17
Total	16,688,126	100.00	36,925,987	100.00	20,237,861	54.81

PRODUCTION OF COLD AND HOT AND WARM BLAST CHARCOAL PIG IRON, 1917-1921.

Kinds of iron.	1917.	1918.	1919.	1920.	1921.
Cold blast	5,219	*4,209	2,113	1,734	350
Hot and warm blast	371,306	344,668	324,984	321,662	94,380
Total Gross tons.	*376,525	*348,877	327,097	323,396	94,730

* Includes small tonnage made with charcoal and coke mixed in 1917 and 1918.

PRODUCTION OF PIG IRON BY GRADES, 1920–1921, SHOWING DECREASE BY GRADES.

Grades.	1921.	Per cent.	1920.	Per cent.	Decrease.	Per cent.
Basic	7,753,071	46.46	16,737,722	45.33	8,984,651	53.68
Bessemer and low phosphorus	5,595,215	33.53	12,062,084	32.67	6,466,869	53.61
Foundry and ferro-silicon	2,568,136	15.39	5,957,782	16.13	3,389,646	56.89
Malleable	457,340	2.74	1,310,951	3.55	853,611	65.11
Forge	112,748	.67	318,048	.86	205,300	64.55
Spiegeleisen	56,423	.34	111,449	.30	55,026	49.37
Ferro-manganese	103,755	.62	295,447	.80	191,692	64.88
All other	41,438	.25	132,504	.36	91,066	68.73
Total	16,688,126	100.00	36,925,987	100.00	20,237,861	54.81

PIG IRON MADE FOR SALE BY GRADES IN 1921.

States.	Basic.	Bessemer.	Foundry.	Malleable.	Forge.	All other.	Total. Gross tons.
Maine, Mass.	.....	.....	2,142	.....	.....	.....	2,142
N. Y., N. J., Md.	93,427	35,157	410,330	71,812	7,371	7,790	625,887
Pennsylvania	120,521	188,908	531,904	20,743	14,545	31,589	908,210
Va., W. Va., Ala.	36,490	450	551,296	.....	9,438	3,431	601,105
Ky., Tenn.	944	191	13,883	.....	.....	5,405	20,423
Ohio	221,919	14,885	405,150	135,547	3,698	1,092	782,291
Ind., Ill.	86,149	166,369	203,061	113,292	.....	.....	568,871
Mich., Wis., Mo., Iowa, Col., Wash.	9,393	85	199,073	9,288	.....	1,251	219,090
Total	568,843	406,045	2,316,839	350,682	35,052	50,558	3,728,019

METHODS BY WHICH ALL PIG IRON WAS CAST OR DELIVERED.

States.	Molten condition.	Sand cast.	Machine cast.	Chill cast.	Direct castings.	Total. Gross tons.
Maine, Mass.	.....	2,142	.....	.....	.....	2,142
N. Y., N. J., Md.	256,302	171,084	611,067	76,874	522	1,115 849
Pennsylvania	4,071,738	118,302	1,989,571	70,744	2,411	6,252,766
Va., W. Va., Ala., Ky., Tenn	764,551	442,572	311,126	35,610	5,026	1,558,885
Ohio	2,073,911	177,145	1,544 802	.....	3,755	3,799,613
Ind., Ill. Mich., Wis., Minn., Mo., Iowa, Col., Wash	2,577,973	87,653	1,279,781	12,011	1,453	3,958,871
Total	9,744 475	998,898	5,736,347	195,239	13,167	16,688,126

METHODS BY WHICH BASIC PIG IRON WAS CAST OR DELIVERED IN 1921.

States.	Sand cast, machine cast, chill cast, etc.	Molten condition.	Total. Gross tons.
New York, New Jersey	203,799	185,111	388,910
Pennsylvania	873,108	2,156,193	3,029,301
West Virginia, Alabama, Kentucky	107,791	712,576	820,367
Ohio	521,593	704,204	1,225,797
Indiana, Illinois, Minnesota, Missouri, Colorado	422,068	1,866,628	2,288,696
Total	2,128,359	5,624,712	7,753,071

METHODS BY WHICH BESSEMER AND LOW-PHOSPHORUS PIG IRON WAS CAST OR DELIVERED IN 1921.

States.	Sand cast, machine cast, chill cast, etc.	Molten condition.	Total. Gross tons.
New York, Maryland	134,734	70,191	204,925
Pennsylvania	552,323	1,914,020	2,466,343
West Virginia, Tennessee, Alabama	45,623	51,975	97,598
Ohio	529,011	1,346,864	1,875,875
Indiana, Illinois, Iowa	251,904	698,480	950,474
Total	1,513,685	4,081,530	5,595,215

NON-FERROUS METALS

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Straits Tin	Lead		Zinc	
March	Lake	Electrolytic*	New York	New York	St. Louis	New York	St. Louis
[illegible]	13.00	12.75	29.00	4.70	4.40	4.97½	4.62½
[illegible]	13.00	12.75	28.87½	4.70	4.40	4.97½	4.62½
[illegible]	13.00	12.75	29.37½	4.70	4.40	5.00	4.65
[illegible]	13.00	12.75	....	4.70	4.40	5.00	4.65
[illegible]	13.00	12.75	28.75	4.70	4.40	5.00	4.65
[illegible]	13.00	12.75	29.00	4.70	4.40	5.00	4.65

*Refinery quotation.

New York

NEW YORK, March 14.

All the markets are moderately active and prices in most cases are steady to firm. The copper market is fairly active and prices are stronger. Only moderate activity has characterized the tin market and prices are easier. Buying and consumption of lead continue steady. Sales of zinc have been in fair volume and prices have stiffened.

Copper.—The last few days have been some of the most active this year. Inquiries and sales have not embraced large quantities individually, but in the aggregate the total has been fairly large. They have included both domestic and foreign consumption with the latter predominating and prices obtained for foreign shipment have netted a larger profit than those for domestic delivery. The tone of the entire market is fairly optimistic, but buying is confined for the most part to early deliveries, consumers not being certain yet as to far future commitments. Electrolytic copper for early or 30-day delivery is generally regarded as a minimum at 13c., delivered, or 12.75c., refinery, with some sellers asking a minimum of 13.12½c., delivered, or 12.87½c., refinery. There are also some sellers who will quote these prices as far ahead as May and some will even quote June delivery if combined with May or earlier.

Tin.—The market for Straits tin has not been featured by heavy sales, but the buying which has been reported has been spread over the week, with some business transacted almost every day, both spot and future delivery being involved. Taking the week as a whole there were two days which were the most active. On one day about 300 to 400 tons, mostly future shipment, was sold with dealers and consumers participating, and on another day, while the total was not as large as this, a fair business was done, mostly for future shipment. Most market observers have generally expected a decline and this was realized yesterday when sterling exchange fell to the lowest point in the last month and with it prices for tin also declined. As usual these influences originated in London where unfavorable political conditions predominated and as a result spot Straits tin to-day was quoted in New York at 29c. In London quotations stood at £142 15s. for spot standard, £144 10s. for future standard and £145 5s. for spot Straits. While these prices are not lower than a week ago, they had been higher since then and therefore represent a decline. Arrivals thus far this month have been 4950 tons with 4670 tons reported afloat.

Lead.—Business in this market continues in a steady stream and the healthy condition which has prevailed for so many weeks continues with no change in prices. The leading interest still quotes 4.50c., St. Louis, or 4.70c., New York, for wholesale lots for early delivery, while independents are selling on a basis of 4.40c., St. Louis, or 4.70c. to 4.75c., New York and eastern points.

Zinc.—The market for prime western has strengthened in the last week and quotations are slightly higher at 4.65c. to 4.70c., St. Louis, or 5c. to 5.05c., New York, for early or 30-day delivery. Sales are confined to moderate amounts for early consumption and while this phase of the market is a little more active than a week ago, the attitude of producers continues of such of a nature that offerings are not freely made in the belief that a higher level will prevail in the future. Very little business for delivery beyond 30 days is being taken.

Antimony.—Wholesale lots for early delivery are unchanged at 4.20c., New York, duty paid, with the market quiet.

Aluminum.—Wholesale lots of virgin metal, 98 to 99 per cent pure, for early delivery continue to be quoted by the leading interest at 19c. to 19.10c., f.o.b. plant, depending on the quantity, while the same grade from foreign sources is quoted by importers at 17c. to 18c., New York, duty paid.

Old Metals.—The tendency of the market seems upward and business is more active. Dealers' selling prices are as follows:

	Cents Per Lb.
Copper, heavy and crucible	12.50
Copper, heavy and wire	11.50
Copper, light and bottoms	9.50
Heavy machine composition	9.50
Brass, heavy	7.25
Brass, light	5.75
No. 1 red brass or composition turnings	8.00
No. 1 yellow rod brass turnings	6.25
Lead, heavy	4.25
Lead, tea	3.25
Zinc	3.00

Chicago

MARCH 14.—Copper and zinc have advanced slightly in a dull market, principally because of firmness on the part of producers. Tin has declined in sympathy with another reaction in the London market and antimony has receded with the delivery of several cargoes at New York docks. Old metal prices remain unchanged. We quote in carload lots: Lake copper, 13.25c. to 13.50c.; tin, 30.50c.; lead, 4.50c.; spelter, 4.75c.; antimony, 6c., in less than carload lots. On old metals we quote: Copper wire, crucible shapes and copper clips, 9.50c.; copper bottoms, 7.50c.; red brass, 7.50c.; yellow brass, 6c.; lead pipe, 3.25c.; zinc, 2c.; pewter, No. 1, 22c.; tin foil, 23c.; block tin, 25c.; all buying prices for less than carload lots.

St. Louis

MARCH 14.—Reports from the tri-state field of Kansas, Missouri and Oklahoma tell of improved business conditions and a larger production of lead and zinc. The Eagle Pilcher Lead Co. has resumed full operations at Joplin, Mo., by adding 75 men to its force, bringing it up to 600. We quote lead at 4.40c., car lots, and slab zinc at 4.65c. On old material we quote: Light brass, 3.50c.; heavy red brass, 7c.; light copper, 7c.; heavy yellow brass, 4c.; heavy copper and copper wire, 7.50c.; pewter, 15c.; tin foil, 16c.; tea lead, 2c.; aluminum, 9c.

Cutting Tests for High-Speed Tool Bits

During the past month the Bureau of Standards of the Department of Commerce completed 60 more tests of ½-in. high-speed steel tool bits. The bits were of several grades of high-speed steel which had been subjected to various heat treatments. The steel used was the same for each test, the percentage of the various elements being as follows: Carbon, 0.62; chromium, 3.5; tungsten, 15.5, and vanadium, 1.6 per cent. The results, in pounds of metal cut away, are given in the accompanying table.

Results of Cutting Tests for High-Speed Tool Bits

Preheating (20 Min.) Deg. Fahr.	Hardening (5 Min.) Deg. Fahr.	Quenched in	Metal Cut Per Tool (4 Tools Tested) Lb.
1400	2417	Oil	9.1
1500	2417	Oil	10.1
1600	2417	Oil	5.1
1600	2417	Water	5.1

Testing conditions were the same in all cases. The results obtained when using water as the quenching medium are about the same as when using oil for this particular case.

PERSONAL

E. G. Rippel, who has been sales manager of the Buffalo Foundry & Machine Co. since its organization, has resigned that position and withdrawn from the company with a view to absenting himself from business for some time. It is more than 21 years since Mr. Rippel organized the Buffalo Foundry Co., the expansion of which into the present company was a noteworthy development. C. W. Pearson, assistant treasurer of the Buffalo Foundry & Machine Co., succeeds Mr. Rippel as sales manager.

The Ohio Locomotive Crane Co., Bucyrus, Ohio, formerly represented in the New York district by J. N. Kinney, 30 Church Street, New York, has appointed Scott B. Lilly, formerly associated with J. N. Kinney, its representative with office at 30 Church Street.

E. M. Griffiths the founder of Burton Griffiths & Co., Ltd., of London, England, has resigned his position as managing director and chairman of that business and has also retired from the board of the Birmingham Small Arms Co., Ltd., so that he is no longer associated with the control of either company. His city address is now 30-32 Ludgate Hill, London, E. C.

Benjamin Graves, milling machine engineer Brown & Sharpe Mfg. Co., Providence, R. I., last week delivered an address on the construction and use of milling machines at the March meeting of the Engineering Club, Greenfield Tap & Die Corporation, Greenfield, Mass.

J. B. Bartholemew, structural steel sales agent, Bethlehem Steel Co., Boston, has accepted a position with the W. B. Kilgoire Co., Chicago. A. D. Dickson is acting structural steel sales agent, Bethlehem Steel Co., Boston.

G. R. Demming, of the Demming Co., Salem, Ohio, was elected president of the Salem Manufacturers' Association at the recent annual meeting, and H. M. Silver of the Silver Mfg. Co., was elected vice-president.

H. W. Gledhill, formerly Philadelphia district manager and special representative of the marine and terminal department of the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., has been appointed eastern sales manager in the New York office. The eastern district territory now includes Delaware and eastern Pennsylvania, formerly in the Philadelphia district and New Jersey, New York and the New England states.

Charles S. Vought, formerly vice-president and European representative of American Steel Export Co., who has recently returned from a trip around the world, has joined the sales force of the New York office of the Donner Steel Co. Mr. Vought for many years was connected with the Cambria Steel Co., Johnstown, Pa., where he received his early training in the steel business.

R. O. Gill, formerly production manager of the Packard Motor Car Co., Detroit, has been promoted to be factory manager.

Charles Rogers, formerly superintendent of the Michigan Gray Iron Castings Co., Detroit, has become a superintendent for the Monroe Steel Castings Co., Monroe, Mich.

J. R. Camm has been appointed assistant to C. J. Sturgeon, manager of the Cleveland office of Hearmey & Liecker Co., Milwaukee, and will cover the southern portion of Ohio, with residence at Dayton. Mr. Camm is a brother of J. A. Camm, sales manager of Hearmey & Liecker, and has been connected with the company's Milwaukee office for the past two years.

At the recent yearly meeting of the Lumen Bearing Co., of Buffalo and Youngstown, L. S. Jones, general manager, was elected to the board of directors, succeeding H. P. Parrock, who has severed his connection with the interest. The board and its officers are: W. H. Barr, president and treasurer; C. H. Bierbaum, vice-president; N. K. B. Patch, secretary, and L. S. Jones, general manager, all of Buffalo; Kester Barr, Lucius B. McKelvey, Thomas Parrock, B. G. Parker and J. Fearnley Bonnell, all of Youngstown. Kester Barr is manager of the Youngstown plant of the company, which is now operating about 20 per cent.

J. G. Hoffman, Wheeling, W. Va., has been elected president of the Buckeye Aluminum Co., Wooster, Ohio, to fill the vacancy caused by the recent death of George W. Blake, who was both president and treasurer. Robert Blake, who has been secretary, was elected secretary, treasurer and general manager. W. R. Curry of Wooster, Ohio, was elected first vice-president and J. L. Ellis, of Wheeling, second vice-president. Oscar H. Foss has been appointed sales manager.

Alfred Herbert, Ltd., British machine tool builder, has closed its New York office at 50 Church Street and the American representative in charge, E. D. Mitchell, will return to England on April 19. The Vandyck-Churchill Co., 149 Broadway, New York, has been appointed sales agent in this country for the Alfred Herbert turret lathes and chucks.

Controversy as to Molders' Wages in Boston

Definite action is anticipated this week in the controversy between the foundry owners in Boston and vicinity and the molders' union, over wages. The foundry owners' original agreement with the molders' union expired Feb. 15, but was extended another month at the ruling wage because at that time the question of a new wage scale was not settled.

The molders are receiving 75c. an hour, with a working schedule based on an eight-hour day, 48 hours per week. The employers have offered the men 70c. an hour on the same basis of hours, the agreement to run until Aug. 15, next, and refuse to recede from their position. The local molders' union has voted against acceptance of this wage schedule, but has failed to sanction a strike. There the matter rests.

About five years ago, a disagreement over wages and hours arose between employer and employee, and there was a strike which lasted about a fortnight. At that time, the foundries were busier than they are to-day. To-day few foundries in Boston and the vicinity are operating a full week, and it is largely because of this fact that the union members are against accepting a reduction in wages. They demand the present wage scale be continued until Aug. 15.

Coke Production Maintained

UNIONTOWN, PA., March 13. — Coke production is being maintained in the Connellsville region, as is the output of by-product coal, especially in the southern Klondike plants of the H. C. Frick Coke Co. The present situation in the coke market apparently is unaffected by the threatened strike in the union coal fields. Production during the past week probably will show an increase of around 7000 tons. A few additional ovens were added to the active list during the week. Highest coke quotations as the week closed were $3.25 to $3.60 for furnace coke and $4 and $4.50 for foundry coke.

The coal market is presenting an unusual situation as March wears on. Apparently the consumers have discounted the strike, for the market in the Connellsville bituminous region this week has been decidedly softer. Observers believe that consumers have pretty ample reserve stocks and are depending, should the emergency develop, upon non-union fields to meet the present demands of the industry. There will be no change in wage schedules in the Connellsville region this quarter.

The Board of Water Supply, Twenty-second Floor, Municipal Building, Park Row and Centre Street, New York, is taking bids until 11 a. m., March 2, for a quantity of steel castings, gate valves and steel pipe appurtenances for use on the Catskill Aqueduct, as per plans and specifications on file (Contract 212). Benjamin F. Einbigier is secretary of the board.

OBITUARY

COL. JOHN SARGEANT, 59, of Bellevue, Ky., president the Domhoff & Joyce Co., Cincinnati, whose death March 4 in a Buffalo hospital was announced in THE IRON AGE of March 9, had been under a physician's care for several months. Colonel Sargeant was born May 10, 1862, at the village of Wass, Northern Yorkshire, England. He came to the United States at the age of 17, and located at Cincinnati, where he secured a position with the claims department of the Southern Railroad in 1879. In 1889 he left the railroad and became associated with the Matthew Addy Co., pig iron merchant. He continued with that company until 1896, when he organized the Domhoff & Joyce Co., then a small selling concern dealing in pig iron and steel. Through his efforts this concern has grown steadily and rapidly. Mr. Sargeant was president and treasurer of the Domhoff-Joyce Co., also president of the South Dayton Railway Co., director of the Campbell County Bank, Bellevue, and financially interested in a number of other business enterprises. He was looked upon throughout the country as an authority in the iron and steel business. He was a member of the Cincinnati Business Men's Club, Cincinnati Chamber of Commerce and Cuvier Press Club, also a member of the Southern Club of Birmingham, Ala., and Mountain City Club, Chattanooga, Tenn. He was a leader in Republican politics in Campbell County and the State of Kentucky, and was a close personal friend of United States Senator Richard P. Ernst and Governor Edwin P. Morrow of Kentucky. When Governor Morrow assumed office, one of his first official acts was to appoint Mr. Sargeant a colonel upon his staff. He was very philanthropic and no interest of charity ever sought assistance without obtaining liberal response. He is survived by his wife, one daughter and two sons, Chas. A. Sargeant, vice-president and treasurer of the Domhoff & Joyce Co., and Harry Sargeant, also a director of the same company.

COL. JOHN SARGEANT

Harry Firmstone

HARRY FIRMSTONE died in Philadelphia on March 10 in his seventy-fourth year. He was born near the York Road in the northern suburbs of Philadelphia. He was educated at the Polytechnic Institute, which stood on what is now the southwest corner of Market and West Penn Square, the site of the Third National Bank. Mr. Firmstone's father and grandfather came to the United States from England about 1834 and went directly to Scioto County, Ohio, under an engagement to build a hot blast stove in connection with a charcoal furnace that was being operated in that county. In 1836 William Firmstone, Harry Firmstone's father, built a hot blast stove for the Vesuvius furnace in Lawrence County, Ohio. In 1837 he blew in a furnace at Phoenixville, Pa., for Reeves, Buck & Co. In 1835 he was successful in making good gray forge iron at the Mary Ann furnace in Huntingdon County, Pa., using coke made from Broadtop coal, and in 1839 he made pig iron with coke in Clearfield County. Soon after this he became associated with the Pardees and the Fells and located at Glendon, near Easton. Harry Firmstone and Frank Firmstone were associated with their father, as young men, in the operation of the Glendon and the Andover furnaces. Along about 1867 these interests came into possession of a large tract of ore land and a charcoal furnace in Virginia, and they developed what was afterwards known for a great many years as the Longdale property at Longdale, Va. These same interests were also the owners of the Cranberry mine in North Carolina, and for many years operated the charcoal furnace at Cranberry, N. C., and were interested in the operation of the Johnson City furnace, Johnson City, Tenn., which still uses the Cranberry low phosphorus ore. In 1912 the Longdale Iron Co. started to liquidate, selling all their various properties, except the home property at Longdale, Allegheny County, Va. Harry Firmstone had made his home for many years at this place and so he made a proposition to his associates that he buy this property for a home, and they agreeing to this, he purchased it, and has been living there ever since.

"There is probably no family more deeply interested and more responsible for the birth and progress of the pig iron industry in America than the Firmstone family," said a prominent pig iron merchant of Philadelphia. "They were pioneers in many of the great changes and improvements in the business, and, at the same time, they were good business men, and successful operators. The companies with which they were connected and for whose management they were responsible always made money, and no man who has lived in the iron business was more scrupulous than Harry Firmstone in living up to his contracts and agreements. Many times when there was a question in Virginia in regard to a contract it was decided to leave it to Harry Firmstone, even if he were one of the parties at interest."

WILLIAM C. SKINNER, chairman board of directors Colt Patent Firearms Co., Hartford, Conn., died in that city March 8. Mr. Skinner was a native of Malone, N. Y., where he was born in 1855. He became an official of the Hartford arms company in 1889, was made vice-president and a director in 1901, and president in 1909.

JAMES E. GREENSMITH, president Boston Scale & Machine Co., Boston, died March 8. He was born in Burton-on-Trent, England, where he was educated as a mechanical engineer. His early business experience was in India, whence he came to this country to take charge of the Pond Machine Tool Co., which at that time was preparing for a new factory in Plainfield, N. J. He supervised the construction and equipment of this plant, as well as the design and development of a new type heavy gun turning and boring lathe later installed at the Watervliet arsenal. Mr. Greensmith's next position was with the Portland Co., Portland, Me., as superintendent, where he remained a short time, going then to the Mason Machine Works, Taunton, Mass., where he was superintendent for many years. For the past six years he has been the president and general manager of the Boston Scale & Machine Co. He was an early member of the A. S. M. E.; also the Engineers' Club of Boston.

JOHN HASSALL, president of John Hassall, Inc., Brooklyn, nail manufacturer, died at his home on March 12. He was 82 years of age and a veteran of the Civil War. Mr. Hassall is credited with having built the first wire nail machine, in 1851. It was in use in his plant for 52 years and is now on display in the industrial museum of the American Steel & Wire Co. at Worcester.

The Dickson Construction & Repair Co., Youngstown, Ohio, has taken over maintenance-of-way work on the entire system of the Western Maryland Railway, with headquarters at Baltimore. The company is handling the work on a contract basis and has largely retained the old force of laborers, but at reduced wages. J. B. Dickson, formerly a general manager of the Erie railroad, heads the construction company, which likewise has charge of maintenance-of-way work on the Ohio Region of the Erie Railroad.

The H & G Die Head Works of the Eastern Machine Screw Corporation are working 10 hours a day, five days a week, and January and February this year have shown decided improvement.

BOOK REVIEWS

Wealth and Income of the American People. By Walter Renton Ingalls, director of the American Bureau of Metal Statistics, formerly editor of *Engineering and Mining Journal.* Cloth; pp. xiv + 321, 5¼ x 8½; G. H. Merlin & Co., York, Pa. Price, $4.

The poor rewards received by prophets are well known. When the prophecy comes true, it appears as if it had been easy to make the prophecy. The value of the work Mr. Ingalls has done is likely to be similarly underrated. While he presents a great amount of valuable fresh information, his chief work is the dispelling of illusions and the reader accompanies him with such confidence that when it is all over the fact that the illusions did exist is apt to be slighted.

The title does not suggest the real scope of the work. Statements of the wealth and income of the American people are made not as an end, but as a basis for determining what occurred during the war and during the period of extravagance afterward and for forecasting what we are going to be forced to do.

Recently the National Bureau of Economic Research made a careful study and compiled statistics of the income of the people of the United States in each of the years 1909 to 1919 inclusive. The bureau refrains from drawing conclusions from the statistics it gathers. Part of Mr. Ingalls' work is to interpret the findings, but the book is much more than a mere interpretation of these findings, for Mr. Ingalls first makes a careful study of the wealth of the people. The fact is perhaps commonly known that in certain non-census years the Bureau of the Census has presented a statement of what has been called the "wealth" of the United States, but few, probably, know what the figures have been or have any clear conception of what they represent. The latest was for the year 1912, and would therefore be useless for a study of economic changes wrought by the war even if trustworthy, which Mr. Ingalls doubts.

An inventory of the national wealth is obviously very difficult. Mr. Ingalls attempts such an inventory for the two years 1916 and 1920 for comparative purposes, and displays such aptness in guessing the probable error in each item considered and such knowledge of the details as to make even this part of the work of no little interest to the average reader.

Of course the majority of men realize that they entertained illusions as to the economic effects of the war, and they rather pride themselves on having lately seen the light, but Mr. Ingalls' conclusions would indicate that the illusions were greater than have been commonly admitted, hence there has remained much misconception to be dispelled.

The estimates of the internal wealth of the United States are $268,000,000,000 at the end of 1916 and $272,000,000,000 at the end of 1920, with a probability that the figure for 1920 is overstated, so that it is doubtful whether there was even the trifling increase indicated. The wealth in each case is, of course, measured in 1913 dollars, there being nothing else conceivably possible as a standard. It is a fallacy that the United States profited during this period. It may have profited during the war prior to its own entrance, but the profits are represented chiefly in debts due to the country, the eventual payment of which is more or less doubtful. One of the fallacies prevalent at the time at least is that the high prices obtained for goods in 1915 and 1916 contained correspondingly large profits, the fact being that much of the excess price was simply payment of the capital necessary to be employed in creating productive facilities, the usefulness of which would afterward disappear.

Mr. Ingalls undertakes to show that the increase in production during the war was greatly overrated, that not enough allowance was made for the increase in prices, so that the physical increase was almost negligible. Thus he deduces that the quantity of raw material produced per capita was about 11.5 tons in 1913, 11.9 tons in 1917 and 11.7 tons in 1918 and 1920, while in every other year since 1913 it was either less or at least no greater than in 1913. Then it is added: "Nor is there any good evidence of the exercise of increased man-power in manufacturing, carrying and trading, but rather are the indications the other way. If there had been no war, the probability is that the American people would have proceeded along the even tenor of their way, adding annually to the national wealth by accounts varying a little according to whether it were a good or a bad year, but in general accumulating at a rate a little in excess of the rate of increase in population."

The fallacy that the war has produced or procured a much higher standard of living is one we know has not been dispelled from the minds of many people. Mr. Ingalls quotes an interview given on as late a date as Aug. 21, 1921, by Samuel Gompers: "Certainly we are going to fight to our utmost the reduction of wages. . . . The workman needs some of the worthwhile things of life, and we are going to fight to see that he gets more than a bare existence." Plausible budgets in support of an income of $2,000 to $2,500 for the family have been presented, but the income of the American people does not find the money.

The Great War did not so increase efficiency in production and distribution that the losses of the war would be outweighed and the people as a whole would benefit out of the net result. The war was not only destructive but also it was, broadly speaking, sterile. There was no lasting uplift in the minds of the people. On the contrary, there was deterioration in morale, and also in morals. Of invention in military machinery and methods there was much; in industrial machinery and methods there was some, but on the whole it was disappointing.

This cursory review of Mr. Ingalls' book merely gives a few illustrations of the method of treatment of the theme that runs throughout. As to the corporations and the war, the author says: "The prevalent idea has been, and still is, that the corporations of the United States waxed greatly during the war. They are regarded as comprising the quintessence of profiteering. Taxation has been directed especially toward them. Let us therefore try to ascertain what are the facts." Then with nine pages of analysis he finds "the surpluses were economically fictitious" and "the misconception about this is a part of the tragedy of Wall Street."

The findings of the National Bureau of Economic Research, as to incomes, have been published. What Mr. Ingalls does not analyze the figures, but it is not inappropriate to mention an interesting point in the bureau's findings, that of the total income in 1909, 68.7 per cent went for wages and salaries and 31.3 per cent for management and property. To and including 1914 the percentage for wages and salaries increased, while in the next two years there was a sharp drop, because prices and profits advanced more quickly than wages, the proportion becoming 66.7 per cent in 1916. Then the proportion increased, so that in 1918 it was 77.3 per cent for wages and salaries and 22.7 per cent for management and property. There the bureau's division ends. For 1919 Mr. Ingalls estimates 80 per cent and 20 per cent respectively. He believes there must be a reversion to 75 per cent or 70 per cent, or perhaps less in the proportion for labor and a retraction in the scale of living.

The above gives but hints of Mr. Ingalls' various conclusions. The book should be read by those who wish information and are willing that new lines of thought be suggested to them. The style is lucid throughout.

NEW BOOKS RECEIVED

Giesserei-Handbuch.—Compiled by the German Society of the Iron Foundry Industry. Pages 264, 6½ x 9½ in.; illustrations, 34. Published by R. Oldenbourg, Gluckstrasse 8, Munich, Germany. Price, 300 marks.

Engineers License Laws.—Compiled by the American Association of Engineers, 63 East Adams Street, Chicago. Pages 136, 8¾ x 6 in., paper covers. Price, 50 cents.

IRON AND INDUSTRIAL SHARES

Investment Buying Appears When Steel Shares Are Offered for Sale

Increased mill activity and higher prices for mill products so far have had little appreciable influence on steel company share values. Such securities have ruled firm the past week, however, due to the appearance of good investment buying whenever shares were offered for sale. The offering in this country of a large issue of a French steel producers' securities in banking circles is admitted as an act of confidence in the domestic industry. Most of the anticipated adverse 1921 reports have been issued by our steel corporations, and investors and bankers feel we have entered a period when slow yet steady expansion will be in order. Better buying of farm machinery already reflects higher prices for grains and cotton, and of railroad equipment increasing transportation revenue. On the strength of such buying, there has been more inquiry for shares of those corporations supplying these things.

The range of prices on active iron and industrial stocks from Monday of last week to Monday of this week was as follows:

Allis-Chal., com..	45 - 47⅝	Int. Har., pf....	108⅝-109
Allis-Chal., pf...	91 - 92	Inland Steel	49 - 49½
Am. B.S. & F., cm.	57 - 61	Lacka. Steel ...	46 - 48¼
Am. B.S. & F., pf.	101¾-102⅝	Lima Loco., com.	94½-104¾
Am. Can, com...	40¾- 45⅛	Lima Loco., pf..	102 -104
Am. Can, pf.....	103½-104⅞	Midvale Steel ...	29¼- 30½
Am. C. & F., com.	149½-156⅞	Nat.-Acme	12 - 13½
Am. C. & F., pf.. ..	-119⅛	Nat. E. & S. com.	33¾- 40
Am. Loco., com..	107⅜-111¼	Nat. E. & S., pf.	81 - 85½
Am. Loco., pf... ..	-117	N. Y. Air Brake	63 - 66¼
Am. Rad., com..	87½- 88⅜	Nova Scotia Steel	22½- 23
Am. St. Fd., com.	32¾- 34⅝	Otis Steel	9¾- 10¾
Am. St. Fd., pf..	96 - 96⅞	Fressed St., com.	65½- 69½
Bald. Loco., com.	104 -108⅛	Pressed St., pf.. ..	- 92
Bald. Loco., pf..	108½-109	Rv. St. Spg., com.	97 - 98¾
Beth. St., com...	58 - 59⅝	Replogle Steel ..	28⅞- 30⅝
Beth. St., Cl. B..	62⅝- 65¼	Republic, com. ..	48 - 51⅛
Beth. St., 8% pf.	106⅞-110	Republic, pf.	76½- 79½
Brier Hill, pf.... ..	- 94	Sloss, com.	34½- 37
Brit. Em. Steel..	8½- 8¾	Steel of Can..... ..	- 58
Brit. Em. St., 2 pf	19½- 21½	Steel & Tube, pf.	68 - 70
Chic. Pneu. Tool.	65⅝- 66	Stewart-Warner..	33¾- 36½
Colo. Fuel	26½- 27¾	Superior Steel	- 28
Cruc. St., com...	55½- 58¾	Un. Alloy Steel..	27½- 28½
Cruc. St., pf....	83 - 85	U. S. Pipe, com..	28¾- 31⅛
Dom. Steel	22 - 23	U. S. Pipe, pf....	63⅜- 65⅛
Deere & Co.....	71½- 72	U. S. Steel, com..	93¼- 95¼
Gen. Electric ...	152½-157	U. S. Steel, pf...	116 -117⅞
Gt. No. Ore Cert.	34⅛- 34⅞	Vanadium Steel..	34¾- 37¾
Gulf States St...	68½- 73⅝	Va. I. C. & Coke.	45 - 46½
Gulf S. St., 1 pf. ..	- 90	Whouse A. B...	85 -100
Harb.-Walker	-100	Whouse Elec. ..	54½- 58
Int. Har., com...	90½- 92½		

Industrial Finances

Preliminary statement of General Motors Corporation, for the year ended Dec. 31, 1921, shows that, after providing for depreciation, inventory adjustments, etc., and setting up a reserve of $14,000,000 to cover anticipated losses not yet ascertainable, there was a deficit of $38,680,770. This compares with net income of $37,750,375 in 1920, which, after deduction of preferred and debenture dividends, was equivalent to $1.58 a share earned on the common stock. Deficit, after dividends for 1921, was $65,459,056, against a surplus of $14,236,660 in the preceding year. Profit and loss surplus at the close of last year totaled $55,814,160, compared with $121,273,217 on Dec. 31, 1920.

The Taylor-Wharton Iron & Steel Co. for 1921 reports a deficit of $1,148,827, after charges for interest and depreciation, comparing with a surplus of $392,045 in the previous year.

New York Air Brake Co.'s report for the year ended Dec. 31, 1921, shows net loss, after charges and taxes, of $458,699. This compares with net profits of $751,860, equivalent to $7.51 a share in the preceding year, earned on the $10,000,000 capital stock in the preceding year.

Earnings of American Steel Foundries from operations last year, after deducting manufacturing, selling and administration expenses, were $1,428,187.61. Adding miscellaneous income of $325,885.47 and deducting for depreciation $512,734.55 and an aggregate of $566,329.48 for interest charges, for earnings of subsidiary company appertaining to minority stockholdings and for excess profits and income taxes, leaves a balance of net profits for the year of $675,009.05. Cash dividends of 7 per cent on the preferred stock and $3 a share on the common stock were declared during the year; the statement shows that the common dividend of $1,833,090 was paid largely out of surplus. The unappropriated surplus now stands at $8,971,033.03. The appropriated surplus is $3,314,143.50.

The National Lead Co. is one of the few concerns able to report satisfactory earnings for last year. Its net earnings for 1921 after deducting all expenses, reserves, etc., amounted to $3,481,512. Dividends deducted from these earnings amounted to $2,945,056. The surplus to Dec. 31, 1921, was $20,880,874.

The report of the Worthington Pump & Machinery Corporation for the year ended Dec. 31, 1921, shows net income of $1,810,949 after interest, depreciation and federal taxes, but before inventory losses. A charge of $1,999,579 was made for inventory adjustments, making net loss for the year of $188,630. In 1920 the company reported net income after interest, depreciation and federal taxes of $2,030,923, equivalent after allowing for annual dividend requirements on Class A and Class B preferred stock, to $7.85 a share earned on the $12,992,149 common stock.

The annual report of the National Acme Co., Cleveland, for the year 1921 shows net sales of $3,879,072, as compared with $15,758,921 in 1920. The operating loss for 1921 was $920,087 and total losses, including $2,315,137 as adjustments on inventories, were $3,727,498. Deducting inventory adjustments, depreciation and taxes, the direct operating loss was $462,500. The size of the inventory loss is explained by the statement that Treasury Department rulings prevented full inventory readjustments during 1920, only $855,000 being written off during that year. The surplus Dec. 31, 1921, was $1,536,775.

The Electric Controller & Mfg. Co., Cleveland, in its annual report for 1921 shows an operating loss for the year of $240,719. After paying dividends and retiring a portion of the preferred stock the surplus was decreased $441,101. Inventories have been reduced more than $200,000 and the current assets are $954,128, against current liabilities of $143,340.

After all charges, depreciation and federal taxes, the Yale & Towne Mfg. Co., hoists, etc., showed net profits last year of $1,269,214, equivalent to $25.39 a share on its $4,998,774 stock. In 1920 the profits were $2,324,470, or $46.51 a share. On Dec. 31 last the profit and loss surplus stood at $11,780,131, as against $11,465,795 at the close of 1920.

The Northway Motors Corporation, 1 Beacon Street, Boston, manufacturer of motor trucks, is perfecting plans for a merger with a number of allied companies, with a note issue of $400,000 to carry out the details of the amalgamation. Arrangements for the manufacture of 1500 motor trucks during the present year, recently announced, will be changed to a lower production schedule.

Harry J. Lewis and L. C. Bardy have been appointed receivers for the Pittsburgh Steel Tube Co., with a plant at Beaver, Pa.

Directors of the Westinghouse Air Brake Co., Wilmerding, Pa., at a meeting held March 9, reduced the common stock dividend from $7 annually to $4, declaring a quarterly dividend of $1 per share, payable April 29 to stockholders of record March 31, as against $1.75 quarterly, the rate from 1918 to 1921, inclusive. Part of the dividend disbursements in 1921 were from the surplus. The annual report of the company for 1921 shows net profits of $1,412,490 and a surplus of $12,931,100.

The Superior Steel Corporation, Pittsburgh, in its report for 1921, shows a net operating loss for the year after expenses and depreciation charges of $273,395, as compared with a net profit in 1920 of $1,022,820. After deducting sinking fund and dividend requirements in 1921, there was a deficit of $1,115,373, against a surplus of $205,547 in 1920.

Penn Seaboard Steel Deficit

The 1921 report of the Penn Seaboard Steel Corporation shows a deficit after expenses, tax, interest, etc., of $749,045. This compares with a deficit of $768,247 in 1920.

The income account compares as follows:

	1921	1920
Loss after expenses.....	$207,188	*$379,366
Interest, sinking fund, etc.....	541,857	388,881
Deficit	749,045	768,247

*After expenses, adjustment of inventory, and Federal tax.

The profit and loss account shows surplus on Jan. 1, 1921, of $4,915,251. Proceeds from additional shares issued for purchase of Rockaway Rolling Mills, Titusville Porch Company, etc., were $1,660,228, making a total of $6,575,479. Deducting deficit of $749,045 in 1921, adjustment and extraordinary charges of $847,434, and dividends on Tacony Steel preferred stock of $18,832, the surplus as of Dec. 31, 1921, amounted to $4,960,168.

The Rendall Steel Products Co., Real Estate Trust Building, Philadelphia, has been appointed sole United States agent for a term of years of Mellowes & Co., Ltd., Sheffield, and is distributing that firm's catalog descriptive of lead sheathed skylight bars.

Machinery Markets and News of the Works

NO DEFINITE TREND TO MARKET

Machine-Tool Sales and Inquiries in Small Volume with No Improvement

Better Operation of Industrial Plants Brings Hope, However, That Betterment Will Come Soon

Indications are still lacking of any definite trend toward improvement in machine-tool business. During the past week in some markets, notably New York and Chicago, there has been extreme dullness. In New York it is noted that even inquiries have fallen off.

The most hopeful sign of prospective increase in machine-tool buying is the gradually increasing operation of metalworking plants. The interest of machine shops in new equipment has been manifested by the fairly large number of inquiries issued since the first of the year, but buyers continue hesitant about placing orders.

A number of important projects which involve substantial purchases of machine-shop equipment are pending, but action has been repeatedly deferred. Orders are expected soon, however, for about 20 tools and 20 cranes for extensions to the Whitaker-Glessner steel plants, and the West Leechburg Steel Co. is expected to buy a 16-in. continuous hot strip mill and auxiliary equipment within a week or two.

About $100,000 worth of mail trucks, platform trucks, mail conveying machinery and other equipment has been purchased for the new Union Station in Chicago.

The Western Clock Co., La Salle, Ill., has purchased about 20 automatic screw machines. The H. H. Franklin Mfg. Co., Syracuse, N. Y., has bought several lathes.

Railroad buying is in small volume. The New York Central has bought a 90-in. driving wheel lathe and the Clinchfield Railroad is reported to have bought several tools. The Rutland Railroad's tool requirements total about $40,000 and those of the Central of Vermont about $25,000, but official approval of these lists, it is understood, has not yet been given. The Bangor & Aroostook Railroad is in the market for four small tools. The Santa Fe has added a few tools to its outstanding inquiries.

A considerable improvement in the demand for locomotive cranes is an indication of expansion of general construction work.

New York

NEW YORK, March 14.

No improvement in machine-tool business in this market has developed in the past week; in fact many sellers report that the situation has turned quieter. There are fewer inquiries, while orders are very few and usually for single machines. A large dealer handling both new and second hand machines reports that sales are about equally divided between new and used tools.

The New York Central Railroad has placed an order for its lines West for a 90-in. driving wheel lathe.

The auction sale of the machine-tool equipment of the Owen Magnetic Motor Car Co., Wilkes-Barre, Pa., March 7, 8 and 9, developed prices and disclosed a demand that was highly pleasing to the machine-tool trade. The sale was attended by many dealers, but a large part of the machines sold were purchased by buyers who not only paid good prices but also paid extra for loading for shipment. Including both large and small tools, the prices obtained were something better than 50 per cent of to-day's market. All of the equipment was high-class. Some of the prices obtained follow:

One 42 x 42 in. x 12 ft. Cincinnati planer, $3,600.
One 42 x 42 in. x 12 ft. Cincinnati planer with two heads, $2,050.
One 36 in. Bullard turret lathe, $3,250.
One 14 x 72 in. Norton grinder, $1,550.
One No. 4 Cincinnati vertical milling machine, $1,600.
One No. 4 Cincinnati vertical milling machine, $1,300.
One No. 3 Hendey cone-driven milling machine, $1,532.
One No. 2 Brown & Sharpe plain milling machine, $560.
One No. 2 Brown & Sharpe plain milling machine, $750.
One No. 0 Giddings & Lewis horizontal boring machine, $2,000.
One 22-46 x 12 ft. Putnam drop lathe, $1,100.

Herbert Crapster, 1 Madison Avenue, New York, dealer in railroad equipment, reports the sale to Worcester, Mass., of three 6-ton gasoline locomotives for sewer work.

The crane market is quiet, few sales and new inquiries being reported the past week. Makers of chain blocks and similar hand power equipment, generally sold out of stock, report a tendency on the part of dealers to cut the market prices to unloaded stocks. Of pending business, only the order of the American Car & Foundry Co. for two 10-ton, 70-ft. and 90-ft. span overhead traveling cranes has been placed. It is reported to have been awarded to the Pawling & Harnischfeger Co. Among recent export sales was a 5-ton Reading hand power crane sold by Arthur Appleton, 29 Broadway, New York, to the New Sabinas Co., Cloete, Coah., Mexico.

The Ward Baking Co., Southern Boulevard and St. Marys Avenue, New York, will equip its machine shop with lathes, drills, grinders and other tools. Purchases will be made at an early date.

Officials of the Standard Oil Co. of New Jersey, 26 Broadway, New York, are perfecting plans for the formation of the Standard Oil Co. of Argentina, a subsidiary company, for the operation of oil wells and refineries in the Argentine Republic. About 25,000 acres in the Neuquen field, Argentina, have been acquired and operations will commence at an early date.

The Staten Island Rapid Transit Co., St. George, S. I., operated by the Baltimore & Ohio Railroad Co., Charles Janaway, vice-president in charge, Baltimore, has surveys and plans in progress for the electrification of its entire line, with initial installation to include the division between St. George and Tottenville. The work will comprise power houses, distributing system, car equipment, etc. T. A. Davis is electrical engineer of the Baltimore & Ohio system.

The Advance Boiler Co., Poughkeepsie, N. Y., has awarded a contract to the H. K. Ferguson Co., Euclid Avenue, Cleveland, for a one-story foundry, 100 x 300 ft., brick and steel, to cost about $100,000, including equipment.

Hugh L. Cooper & Co., 101 Park Avenue, New York, consulting engineers, have tendered a proposal to the International Joint Commission, Toronto, for the construction of a series of hydroelectric generating plants on the St. Lawrence River, with dam and main power station near Morrisburg, Ont. The initial installation will comprise 400,000 hp. capacity, and is estimated to cost in excess of $50,000,000. The project will be carried out by private capital, under the direction of the Cooper company and authority as granted by the commission. The entire development totals 1,000,000 hp., with investment of about $150,000,000.

William R. Noe & Sons, 43 East Tenth Street, New York, manufacturers of portable and other electric lamps and fixtures, have purchased property at Willoughby Avenue and Raymond Street, totaling about 16,000 sq. ft., for a three-story, reinforced concrete factory, plans for which are being drawn.

The Cox Klemin Aircraft Corporation, College Point, L. I., manufacturer of airplanes and parts, will install new equip-

ment in its machine shop, including rivet punches, shears and bench tools.

The National Enameling & Stamping Co., 411 Fifth Avenue, New York, is arranging for financing, either by bond or note issues, to an amount of $15,000,000, the majority of the proceeds to be used for plant extensions and improvements.

The Remington Arms & Ammunition Co., 25 Broadway, New York, will devote a portion of its plant at Ilion, N. Y., to the manufacture of a new cash register and parts, and it is proposed to have the initial machines ready for marketing at an early date. Branch offices will be established in a number of cities.

The Light Car Corporation, 401 West Fourteenth Street, New York, has leased property at 171 Christopher Street for the establishment of a new automobile plant. The site is improved with a two and two and one-half story building, 45 x 95 ft.

The Police Department, 240 Centre Street, New York, will use a portion of a fund of $1,000,000 for the erection of an automobile service building and general machine repair works. A site for the structure has been selected under the Williamsburg bridge. Police Commissioner Enright is in charge.

The Long Island Lighting Co., 50 Church Street, New York, is arranging a fund of about $1,000,000 for extensions and improvements in its electric power plant and system. A new 10,000-hp. generator and auxiliary electrical equipment will be installed at the power house at once.

The Board of Estimate, Municipal Building, New York, has granted an appropriation of $600,000 to the Borough of Queens, Long Island City, for the construction of a new incinerator plant and bulkheads, to include electrical apparatus, conveying and material-handling equipment, etc. The Borough engineer is in charge.

A power plant, 67 x 165 ft., with radial brick stack 175 ft. high, will be erected by the Clark Thread Co., 260 Ogden Street, Newark, N. J., at its new bleaching plant at Bloomfield, N. J. Work will commence at once. The installation will comprise two 500-hp. boilers, one 500 kw. generator, and auxiliary equipment. The entire plant will cost $200,000, exclusive of site.

The Board of Freeholders, Court House, Newark, has commissioned Guilbert & Betelle, architects, 546 Broad Street, to prepare preliminary plans for a three-story, brick and steel vocational school, 36 x 184 ft., with two wings each 40 x 120 ft., to be erected at Bloomfield Avenue and Franklin Street, Bloomfield, N. J., estimated to cost $500,000. It will include machine shops, foundry, electrical department, etc.

The Inter-State Safety Appliance Co., Moorestown, N. J., will install new equipment for stamped metal production at its plant.

A vocational department will be installed in the new high school to be erected by the Board of Education, Millville, N. J., estimated to cost $250,000. N. Corson is secretary.

Alfred Hofman & Co., Union, N. J., recently organized, will take over the plant and business at 150-52 Hudson Avenue, heretofore operated in the name of Alfred Hofman. They will manufacture special machinery and parts, including equipment for the production of electric lamps. Alfred Hofman is president, and Victor Anderson, vice-president.

Electric motors and other electrical and mechanical equipment will be installed in the new plant to be erected by the Paterson Industrial Development Co., 5 Colt Street, Paterson, N. J., and occupied under a 20-year lease by the Periodical Press, 80 Lafayette Street, New York. It will cost about $400,000, including machinery.

Export Opportunity

J. R. Smallacombe, First Avenue, Joslin, South Australia, desires catalogs and information regarding a small plant for the manufacture of aluminum sauce pans and other aluminum utensils.

Chicago

CHICAGO, March 13.

Evidences of a definite trend in the machine tool business are still lacking. Some local machinery houses report a slight gain in orders, while others find the situation as dull as ever. That there are signs of a slow recovery of industrial activity, however, is rather generally agreed and it is only a question of time when the market will feel the effects of this betterment in the general situation.

The local tractor plant of the International Harvester Co., which resumed operations only a few weeks ago after a long period of idleness, is now running at close to 75 per cent. Other shops, notably those making railroad supplies, are steadily getting back on a better operating basis.

Prominent among recent orders booked in this district is one placed by the Western Clock Co., La Salle, Ill., for 24 automatic screw machines. A local manufacturer has placed an order for one 4-ft. radial drill, one 20-in. upright drill, one 14-in. x 6-ft. engine lathe and a sensitive drill. The Santa Fe has sent out the following additional inquiries: One heavy duty 24-in. crank shaper; one heavy duty-type gap engine lathe with a swing of 18 in. overbed, 36 in. through gap with bed 14 ft. long; one 54-in. boring mill with two heads; two 18-in. x 8-ft. heavy duty lathes; one 4-spindle combined turning and threading machine for straight and radial stays, and one 2-in. heavy duty-type bolt cutter. The inquiry of the Universal Portland Cement Co., referred to last week, calls for the following machines for delivery at Buffington, Ind.:

One 60-in. x 26-ft. heavy-duty engine lathe.

One 84-in. vertical boring mill.

One type "J" Gisholt turret lathe with 28-in. swing and 7½-in. spindle bore.

One four-head quick return planer with bed 42 in. wide and 12 ft. in length.

One 24-in. x 15-ft. engine lathe.

One No. 1 horizontal spindle milling machine with table 14 in. x 8 ft.

One cold cut circular saw to cut material up to 12 in. in diameter inclusive.

One 1000-lb. single frame steam hammer.

The only new price change reported is the reduction of 20 per cent on pipe machines by the Williams Tool Co., Erie, Pa.

The Red Oak Bridge & Iron Works, Red Oak, Iowa, is in the market for a second-hand steel derrick with an 80-ft. mast and 100-ft. boom to be guyed with 6½-in. galvanized wire ropes; capacity 15 tons. Must be complete with slewing attachments and operated by electric motor.

The Hanna Engineering Works, Chicago, has received an order from the Wyatt Metal & Boiler Co., Dallas, Tex., for a 126-in. reach, 18-24-in. gap., 80-ton riveter, and an order from Imperial Oil, Ltd., Sarnia, Ont., for a 102-in. reach, 15-18-in. gap, 70-ton riveter.

The Boyle Ice Co., 847 Larrabee Street, Chicago, has let contract for a two-story ice manufacturing plant at 542 Linden Avenue, Evanston, Ill., to cost $40,000.

The National Phonograph Co., 824 Albert Street, Chicago, has leased a three-story factory containing 30,000 sq. ft. of floor space, at 2837-47 North Ashland Avenue, for 10 years. The lessor sold $15,000 worth of wood-working machinery and equipment to the lessee.

J. Huether, manufacturer of store fixtures, 1315 West Twenty-first Place, Chicago, has let contracts for a one-story factory, 123 x 124 ft., at 4511-21 Broadway, to cost $20,000.

The Holton-Seelye Co., realtor and builder, 140 South Dearborn Street, Chicago, has let contract for a one-story factory, 50 x 150 ft., at 5100-8 Ravenswood Avenue, to manufacture electric irons, and to cost $10,000.

Ernest J. Kruetgen & Co., engraver, 626 Federal Street, Chicago, will build a two-story plant, 50 x 100 ft., at 913-21 North Fairfield Avenue, to cost $35,000.

The James T. Igoe Co., printer, 117 West Harrison Street, Chicago, has purchased the northwest corner of Van Buren and Jefferson streets, 100 x 125 ft., and will erect a ten-story printing plant to cost $450,000.

A fire in the shop of the Passenger Elevator Safety Lock Co., 119 North Washington Street, Peoria, Ill., recently did damage to the extent of $15,000, of which $10,000 represented damage to machinery.

The Cotta Transmission Corporation, Rockford, Ill., recently incorporated, has taken over the business of the Cotta Transmission Co., manufacturer of Cotta transmissions, and will continue to produce the same line of constant mesh transmissions for trucks, tractors, buses and gasoline locomotives. No increase in plant space or equipment is contemplated at present.

Work is rapidly progressing on the renovation of the former Fisk-Jencks foundry building at Aurora, Ill., recently purchased by the Diversey Foundry Co., Chicago. It is expected that the plant will be ready to resume operations in a short time.

The Jones Road Machinery Co., Galva, Ill., has been reorganized, the new corporation having taken over the entire stock and equipment of the old company. Under the terms of the transaction Charles Jones, the inventor of the Jones road machinery, will receive a royalty on each machine manufactured, besides the original purchase price. The new company has $50,000 capital stock and the officers are: President, George Jones; vice-president, E. H. Fielder; treasurer, H. A. Smith; secretary, Arthur H. Johnson.

The Village Board, Leigh, Neb., contemplates the purchase of a 100-hp. oil engine for the municipal electric light and power plant.

The South Chicago Radio Electric Co. has been formed for the manufacture and installation of wireless telephone

apparatus. Headquarters are at Peulecke's Garage, 9237 Houston Street, Chicago. Walter Peulecke is business manager and construction engineer.

A power house, electrical and mechanical equipment, and other machinery will be installed in the three-story plant, 60 x 140 ft., to be erected by the Mid-West Box Co., 111 West Washington Street, Chicago, at Matteson, Ill., estimated to cost about $300,000. Harvey C. Miller, 112 West Adams Street, Chicago, is architect. K. I. Herman is in charge.

The Gopher Machinery Co., New Prague, Minn., has plans under way for of a one-story factory, 80 x 100 ft., to cost about $50,000. It will form the first unit of a plant. J. C. Niemeyer, 643 Endicott Building, St. Paul, Minn., is engineer.

The Common Council, Eagle Grove, Iowa, has tentative plans under consideration for the erection of a municipal light and power house.

The Hurley Machine Co., West Twenty-second Street and South Fifty-fourth Street, Cicero, Chicago, manufacturer of electrically-operated washing and ironing machines, has acquired the plant and business of the Superior Machine Co., De Kalb, Ill., manufacturer of similar equipment. The new owner will maintain operations at the Superior works as heretofore, and no immediate change will be made.

The International Harvester Co., 606 South Michigan Avenue, Chicago, will take bids at once, through Day & Zimmerman, 608 Chestnut Street, Philadelphia, for its new plant on West Wayne Street, Fort Wayne, Ind., for the manufacture of automobile and tractor equipment, and machinery. The work has been held in abeyance for several months, and is estimated to cost about $500,000.

The Common Council, Granite Falls, Minn., is considering plans for a municipal electric power plant, with improvements in present station. L. M. Marcuson is city clerk, in charge.

Architects Michaelson & Rognstad, 3815 West Congress Street, Chicago, are preparing plans for a one-story foundry and machine shop, the owner's name and location to be announced later.

The Western Instrument Co., Chicago, recently organized to manufacture electric precision equipment, has leased property at 1001 Washington Boulevard, totaling about 8,000 sq. ft. for its new plant. A department will be operated for brass finishing and plating. Julius Severus is vice-president and general manager.

The Northwestern Iron Works, Devils Lake, N. D., is considering the erection of a two-story and basement addition. Plans will be prepared in the near future. Samuel A. Hahn is president.

A vocational department will be installed in the two-story and basement high school to be erected at Preston, Minn., estimated to cost $150,000. Tolz, King & Day, Inc., 1410 Pioneer Building, St. Paul, Minn., are architects.

Buffalo

BUFFALO, March 13.

The Richardson & Boynton Co., 260 Fifth Avenue, New York, manufacturer of stoves, furnaces, etc., with plant at Dover, N. J., is completing arrangements for the purchase of the property and buildings and equipment of the W. A. Case & Son Mfg. Co., Kensington Avenue, Buffalo, manufacturer of similar products. It will be used for a branch plant, transferring certain branches of manufacture from the Dover works to the new location.

The Board of Education, Buffalo, has adopted a resolution requesting the City Council for an immediate appropriation of $3,500,000 for the erection of seven trade and vocational schools to cost $500,000 each, including equipment. Plans will be prepared at once.

Fire, March 5, destroyed the annex to the erecting shops of the Pennsylvania Railroad Co., Olean, N. Y., with loss estimated at about $100,000, including pipe shops, airbrake shops, paint shops and other structures. The buildings were erected as an extension to the main locomotive shops during the war, and it is undecided whether or not they will be rebuilt. The principal erecting shop, damaged by the fire, will be repaired at once.

The Vacuum Oil Co., 61 Broadway, New York, operating refineries at Rochester and Olean, N. Y., has awarded contract to the White Construction Co., Inc., 95 Madison Avenue, New York, for an addition to its Olean plant, with power house, to cost about $1,000,000, including equipment.

The Acme Pattern & Machine Co., 1553 Niagara Street, Buffalo, has leased a portion of the plant of the Thorpe Co., Courtright Street, Bridgeburg, Ont., for the establishment of a branch works. Possession will be taken at once.

A vocational department will be installed in the two-story high school, 130 x 130 ft., to be erected at Williamsville, N. Y., estimated to cost about $175,000.

Edwin J. and John H. Wolf, operating Wolf's Garage, 573 East Delavan Avenue, Buffalo, will install an automobile repair department.

The New York State Gas and Electric Corporation, Ithaca, N. Y., has arranged for a bond issue of $700,000, the proceeds to be used in part for extensions and improvements in electric power plant and system. S. J. Magee is president.

A vocational department will be installed in the three-story high school, 128 x 215 ft., to be erected at Hornell, N. Y., estimated to cost $350,000. Plans are being drawn by Tooker & Marsh, 101 Park Avenue, New York, architects and engineers.

The G. A. Aber Mfg. Co., Watertown, N. Y., will install equipment for the manufacture of automobile motors and parts.

The Mutual Ice Co., Erie, Pa., has plans under way for the erection of a new one-story ice-manufacturing plant, estimated to cost about $65,000. A. C. Bishop & Co., 426 Guardian Building, Cleveland, are architects and engineers.

Cleveland

CLEVELAND, March 13.

Orders and inquiries for machine tools continue to gain, and if the present volume of business holds up March sales will show a fair increase over January and February. Orders are still mostly for single machines, but some buying is being done in lots of two or three tools. Sales are confined for the most part to small and medium size machines, and the business is well scattered among various metal-working industries. Some orders are being placed by automobile parts manufacturers, but very little business has come from automobile plants. The placing of some railroad business has been deferred because of the possibility of a coal strike.

The demand for locomotive cranes has increased considerably, orders coming from various sources particularly from contractors and cement companies. A few export orders are also coming out. The city of Cleveland has placed an order for an 18-ton Orton & Steinbrenner locomotive crane and is in the market for a second crane. The Brown Hoisting Machinery Co. has increased its plant operations, largely on locomotive cranes, from 32 to 44 hr. per week. There is also a better volume of orders coming out for hand operated traveling cranes.

The Erie Railroad has leased several of its large car and locomotive shops to the Meadville Machinery Co., which took over the operation of the shops March 1. They include those at Hammond and Huntington, Ind., Marion, Galion, Dayton and Cleveland, Ohio, and Elmira, N. Y., as well as other shops. The Meadville Machinery Co. was recently incorporated and its officers include William Schlafge, president, and W. C. Cotton, secretary and treasurer.

The Dover Tank & Plate Co., Dover, Ohio, has been incorporated with a capital stock of $24,000 and has taken over the plant of the Acme Boiler Works, Dover. It will specialize in the manufacture of electric welded tanks.

The Lisbon Agricultural Lime Co., Lima, Ohio, has been incorporated with a capital stock of $50,000 and will operate the plant of the Lisbon Lime Co., which will be enlarged and new equipment installed.

The Chastteen Automatic Headlight Control Co., Conneaut, Ohio, has been incorporated with a capital stock of $50,000 and will make automatic automobile headlight controls. It is stated that a factory will be erected. W. J. Chastteen is president.

New England

BOSTON, March 13.

Sales of individual used machine tools in this district the past week in the aggregate were larger than a week ago. The market, however, is far from active. Competition for business from used tool dealers and among manufacturers is bringing out some low prices from the latter, although few if any changes are being made in list quotations. Sales the past week include one No. 164 Toledo press and one No. 84 Bliss reducing press to a South Boston manufacturer of silverware; one No. 40E used Perkins press to a Boston manufacturer of leather buttons; one 6 x 6 x ¾-in. double angle shear to the Lamson Co., Lowell, Mass., conveyors; and a new 20-in. brass working lathe to the Boston & Albany Railroad.

Inquiries have increased, mostly for single used tools, however. The Bangor & Aroostook Railroad is in the market for four new small tools. The Rutland Railroad's list calls for the expenditure of about $45,000, and includes a wheel press, shaper and some smaller tools and pumps. This list has not had the official O. K., however, nor has the Central Vermont Railroad's, which involves about $25,000 worth of

machine tools. A Laconia, N. H., maker of textile mill equipment has bought practically everything on its list excepting a fairly large lathe and shaper, negotiations on these still being in progress. The United Fruit Co., Boston, wants a 14-in. lathe for the Tropico Radio Telegraph Co. The United Lace & Braid Co., Auburn, R. I., is equipping a complete machine shop for the manufacture of its own machinery.

Small tools and machine tool parts continue in good demand, prices on most of which are firmer. The local market on Critchley reamers, however, is now 35 per cent discount, heretofore it was 25 per cent.

The American Sanitary Products Co., Stamford, Conn., organized more than a year ago, will begin at once the erection of a 40 x 60ft. addition.

The Board of Commissioners, Wakefield, Mass., is considering plans for extensions and improvements in the municipal electric lighting plant to cost about $50,000.

The Central Maine Power Co., Augusta, Me., has arranged for a bond issue of $810,000, a portion of the proceeds to be used for extensions and improvements in its hydroelectric generating plants and system. Harvey D. Eaton is president.

Barker & Barker, 86 Page Street, Providence, R. I., manufacturing jewelers, have awarded contract to Mahoney & Tucker, 72 Weybosset Street, for a new factory, 40 x 100 ft. Edgar R. Barker is head.

A vocational department will be installed in the two-story high school to be erected at Laconia, N. H., 125 x 164 ft., and estimated to cost $400,000. Bids will be asked early in April by P. S. Avery, 99 Chauncey Street, Boston, architect.

The Cambridge Electric Light Co., Cambridge, Mass., has filed plans for the erection of a two-story power house at Western Avenue and Blackstone Street to cost $160,000.

The Board of Water Commissioners, New Britain, Conn., will install a new Diesel engine and auxiliary operating equipment at the Polkville pumping station.

A vocational department will be installed in the new high school to be erected at Petersboro, N. H., plans for which are being drawn by John P. Kingston & Son, 507 Main Street, Worcester, Mass., architects.

Reeds & Thorpe, 60 Prospect Street, Hartford, Conn., engineers, have started work on the new power house to be erected at the plant of the Handel Co., manufacturer of lamps and fixtures, East Main Street, Meriden, Conn.

The Magna Automobile Co., Division Street, Holyoke, Mass., is planning to build a two-story garage, sales and service station to cost about $50,000.

The town of Millinocket, Me., plans a vocational department in the new $400,000 high school to be erected. Harry S. Coombs, 11 Lisbon Street, Lewiston, is the architect.

Morris Spirt, 129 Willow Street, Waterbury, Conn., is having plans prepared by C. Jerome Bailey, architect, 65 Bank Street, for a one-story 50 x 110-ft. garage and service station.

Philadelphia

PHILADELPHIA, March 13.

The Philadelphia Steam Heating Co., Juniper and Cherry streets, Philadelphia, heating and equipment engineer, has awarded contract to George H. Evans, 105 North Fourteenth Street, for a two-story and basement factory, 24 x 51 ft., at 5216-20 Lancaster Avenue.

A power plant will be constructed by Albert M. Greenfield & Co., Fifteenth and Chestnut streets, Philadelphia, on property recently acquired at Fifteenth and Ionic streets, for service for a new eighteen-story office building to be erected on adjoining site. The entire project will cost $4,000,000.

A vocational department will be installed in the high school to be erected at Jenkintown, Pa., estimated to cost about $170,000.

The Bureau of Yards and Docks, Navy Department, Washington, will make extensions and improvements in the power plant at the Philadelphia Navy Yard to cost $240,000.

The United States Radiator Co., Detroit, has leased the three-story building at the corner of Twenty-fourth and Vine streets, Philadelphia, totaling about 27,000 sq. ft., for a factory branch.

The General Processing Co., Trenton Avenue and Willard Street, Philadelphia, will install new conveying machinery, shafting, pulleys and other transmission equipment, at its textile mill.

Electric motors, power apparatus and other mechanical equipment will be installed in the first unit of the new four-story building to be erected by the Public Ledger Co., Independence Square, Philadelphia, at Seventh and Sansom streets, estimated to cost $2,000,000.

C. Kohn, Morris Building, Philadelphia, will soon commence the erection of a two-story plant at Glenwood Avenue and Oxford Street, 125 x 300 ft., for the manufacture of boilers, radiators and other heating equipment. It is estimated to cost $80,000.

Vocational equipment will be installed in the new junior and senior high schools to be erected by the Board of Education, Keystone Building, Philadelphia, in different parts of the city, plans for three of which have been prepared, estimated to cost $800,000, $200,000 and $150,000, respectively.

The Trenton Emblem Co., 120 Hamilton Avenue, Trenton, N. J., has filed plans for a one-story foundry.

Subject to final approval by the Court, the Waterbury Clock Co., Waterbury, Conn., has acquired the entire property and business of Robert H. Ingersoll & Brother, manufacturers of watches, bankrupt, for $1,500,000. The sale includes the plant at Trenton, N. J., with rated capacity of 8000 watches a week, and the factory at Waterbury, with output of 11,000 watches weekly. Both plants will be continued by the purchasing company, and operations will be increased at the Trenton works, now running on a curtailed schedule.

The State Highway Department, Broad Street Bank Building, Trenton, N. J., R. J. Wasser, State engineer, will break ground at once for the erection of a one-story automobile service and repair works, 106 x 400 ft., at Fernwood, N. J., to cost $95,000.

The Pennsylvania Edison Co., Easton, Pa., has arranged for a preferred stock issue of $1,350,000, about $800,000 of which will be used for a new generating plant, and other improvements and extensions. The company is a subsidiary of the General Gas & Electric Co., and operated by W. S. Barstow & Co., 50 Pine Street, New York.

The Board of Works, Altoona, Pa., is having plans prepared for a one-story and basement municipal automobile service and repair works, for city cars and trucks. Bids will be asked early in April. H. G. Hinckle is city manager.

Pittsburgh

PITTSBURGH, March 13.

Actual business in machinery and equipment in this district still is moderate, but in almost all lines a good inquiry exists. There is an inquiry for four grinders for export and the trade is expecting action before long on the tools which will be wanted for the new rod and wire plant of the Wheeling Steel Corporation at Portsmouth, Ohio. The West Leechburg Steel Co., which is to install a 16-in. continuous hot strip mill with auxiliary equipment is expected to close this week. The U. S. Electrical Tool Co., reports the sale of two grinders to a Pennsylvania oil company.

The market for cranes still is more active in the prospective than in the actual. The Coshocton Iron Co., Monongahela City, Pa., has taken bids on four cranes, including one 10-ton, one 5-ton and two 2-ton capacity, and is expected to place the order soon. The Standard Plate Glass Co., Butler, Pa., recently closed for a 5-ton, 57-ft. overhead Shaw crane. Much interest centers in the 20 cranes inquired for by the Wheeling Steel Corporation for its Steubenville, Ohio, and Beech Bottom, W. Va., plants awards, of which are likely in the near future.

The Wheeling Machine Products Co., Wheeling, W. Va., is in the market for one 250 or 300-hp. direct-connected steam generator unit, including boiler.

The Galena Signal Oil Co., Franklin, Pa., has purchased about four acres at Richmond, Cal., as a site for the construction of a new refinery, estimated to cost about $500,000, with machinery. Charles A. Miller, superintendent of the refinery at Franklin, will be in charge of construction.

The Harbison-Walker Refractories Co., Farmers' Bank Building, Pittsburgh, has tentative plans under consideration for a new plant at Figart, Iowa.

The American Window Glass Co., Kane, Pa., is dismantling its plant at Smethport, Pa., preparatory to the installation of new machinery of improved type. It is proposed to have the work completed to permit operation in the fall.

A vocational department will be installed in the central high school to be erected by the Red Stone Township Board of Education, Republic, Pa., estimated to cost about $200,000. J. H. Harmon, 632 Fayette Title & Trust Building, Uniontown, Pa., is architect.

Klenck Brothers, Warren, Pa., operating an automobile service works, will install a complete machine repair works.

The Gilmore Coal Co., Oliver Building, Pittsburgh, will build a one-story power plant at its properties near Venice, Pa., to cost about $50,000.

The Interstate Glass Co., Bradford, Pa., has completed plans for extensions and improvements in its plant at Clarks-

burg, W. Va., to cost about $75,000, including equipment. H. J. Waters is president and general manager.

The Dayton Construction Co., P. O. Box 870, Elkins, W. Va., is planning to purchase air compressors, cable guard and other equipment.

The Electric Power Equipment Corporation, 215 Tenth Street, Huntington, W. Va., recently organized, will establish a plant to manufacture wireless equipment and other electrical apparatus. E. C. Broskie is treasurer and general manager.

The American Coal Co., Bluefield, W. Va., will build a new steel tipple at its properties, with capacity of about 400 tons per hour. E. J. McQuail is general manager.

The Slab Fork Coal Co., Slab Fork, W. Va., is planning for the construction of a new steel tipple. It recently increased its capital to $500,000 for expansion. H. G. Caperton, Jr., is manager.

The West Virginia Pulp & Paper Co., 200 Fifth Avenue, New York, is considering rebuilding the portion of its plant at Cass, W. Va., recently destroyed by fire with loss estimated at $200,000, including machinery.

The Common Council, Athens, W. Va., has plans under way for an electrically operated pumping plant for the waterworks department. C. E. Collins, Drexel Building, Philadelphia, is engineer.

The Board of Water Commissioners, Fairmont, W. Va., will build an electrically operated pumping plant in connection with new filtration works, estimated to cost about $150,000. Fuller & McClintock, 170 Broadway, New York, are consulting engineers.

The E. E. White Coal Co., Glen White, W. Va., is perfecting plans for a new steel tipple.

The Ashland Coal & Coke Co., Ashland, W. Va., is planning to rebuild its tipple, recently partially destroyed by fire with loss estimated at $50,000, with hoisting and other machinery.

Indiana

INDIANAPOLIS, March 13.

The Monroe Automobile Co., Indianapolis, recently organized, will take over the plant and business of the William Small Co., 33 West Eleventh Street, heretofore manufacturing passenger cars under the Monroe name. The new owner will make a number of improvements, and proposes to develop capacity production. William Small, head of the acquired company, will be sales manager for the new organization.

The Standard Oil Co., Davidson and Lord streets, Indianapolis, will build a new two-story works, 40 x 200 ft., at Twenty-ninth and Schurman streets, to cost about $100,000. A portion of the structure will be equipped as an automobile service and repair department for company trucks.

A vocational department will be installed in the new junior high school to be erected at Columbus, Ind., for which bonds for $125,000 have just been voted.

The Interstate Public Service Co., Indianapolis, is perfecting plans for a new electric power plant on the Tippecanoe River, near Norway, Ind. The construction of the dam will be commenced at once. The entire plant, with equipment, will cost about $1,225,000 and will be the first of a number of such plants to be established in this vicinity. Edward C. Burch, Monticello, Ind., is manager for the company in this section.

The Indiana Oil Refining Co., Columbus, Ind., is arranging to proceed with the erection of its new refinery, now about one-half completed, work upon which has been held in abeyance for several months. About $100,000 will be expended to bring the plant to completion. The machinery installation will commence some time in April. Louis J. Scheidt is president.

Clayton Cooper and associates, Elwood, Ind., are organizing a company to take over and operate the plant of the Elwood Foundry Co., bankrupt. The building and other property have been acquired recently from William O. Maines, trustee in bankruptcy. The new company will manufacture metal traffic signs and kindred products, as well as general iron castings.

The Northern Indiana Gas & Electric Co., South Bend, Ind., is negotiating for the purchase of the plant and property of the Lafayette Service Co., Lafayette, Ind., now in receivership. Upon acquisition, the new owner will make a number of improvements in line extensions, and connect with its general system.

The Board of Sanitary Commissioners, City Hall, Indianapolis, will receive bids until March 30, for power plant equipment for use in connection with a sewage disposal plant, including: Three 400-hp. watertube boilers, with superheaters, soot blowers and auxiliary apparatus; three chain grate stokers, with capacity 150 per cent of rating, including operating mechanism; three steam turbine blowers, each with capacity of 16,000 cu. ft. per min.; two steam-turbo electric generators, each 500 kw., provided with exciters; five surface condensers, each with about 750 sq. ft. of cooling surface, provided with air and condensate pumps; one electric switchboard, six or more panels, with instruments. Charles H. Hurd, 1405 Merchants' Bank Building, is consulting engineer. Jay A. Craven is president of the Board.

Cincinnati

CINCINNATI, March 13.

Local manufacturers report that while there is still a lack of machine tool orders, the situation is showing signs of improvement, with more inquiries for single machines coming from widely scattered points. Most of the orders placed during the week were for single machines. The Sewell Valley Railroad has purchased one or two tools against its recently revived list and the Clinchfield Railroad has also taken several tools, including a large planer. The H. H. Franklin Mfg. Co. is reported to have placed orders for several lathes, an Eastern manufacturer booking the business. A local manufacturer is figuring on a fairly large order and expects to close the business within the next week or two.

No new railroad lists have been issued, although a large Western railroad is expected to be in the market shortly for a number of machine tools. Action on the Whitaker-Glessner list of 20 tools and 20 cranes is looked for within the next ten days. A recent order placed with a Columbus manufacturer calls for $100,000 worth of equipment for the new Union station at Chicago, consisting principally of mail trucks, platform trucks, mail moving machinery, etc.

The William Kohl Co., 1034 Hulbert Street, Cincinnati, paper box manufacturer, has awarded contract for a five-story fireproof building, 50 x 100 ft., to cost approximately $50,000, to the Ferro-Concrete Construction Co.

The plant and equipment of the Knox Tire & Rubber Co., Mt. Vernon, Ohio, has been purchased by stockholders of the company at Middletown, Ohio, for $175,000. Middletown capitalists were represented by F. D. Litsch. No announcement has been made as to the intentions of the new owners with regard to the operation of the plant.

The plant of the Licking Window Glass Co., Utica, Ohio, was damaged by fire on March 5 to the extent of $150,000. Harry McCann, president, states that it will be rebuilt.

Baltimore

BALTIMORE, March 13.

The property of the Globe Shipbuilding & Dry Dock Co., recently adjudged bankrupt, Curtis Bay, Baltimore, has been purchased by Henry W. Williams and a number of creditors for $1,050,000. The company will be reorganized, new capital secured, and the plant placed in operation.

The United States Radiator Corporation, Detroit, will improve the three-story building at 1162 Scott Street, Baltimore, recently leased for a factory branch. Arthur E. Thain, 2116 Mt. Holly Street, is local manager.

A one-story power house will be erected by the J. L. Gilbert & Brother Lumber Co., Eastern and East Falls avenues, Baltimore, at its new mill, on property recently acquired. An automobile service and repair plant will also be constructed.

The Board of Street Commissioners, Hagerstown, Md., is negotiating with the City Council for a new municipal electric power plant, replacing the present station.

The Empire Sherardizing Co., Baltimore, is establishing a new local plant for metal treatment and will begin operations at an early date.

Fire, March 5, destroyed a portion of the power plant of the North State Power Co., Wendell, N. C., with loss estimated at about $22,000. It will be rebuilt.

The Industrial Department of the Chamber of Commerce, Newberry, S. C., is arranging for the establishment of a local plant to manufacture iron, brass, bronze and other metal products.

Cecil C. Davis, Seventh Street, Bristol, Va., is planning to rebuild his automobile machine shop, recently destroyed by fire with loss estimated at about $17,000.

The Carolina Power Co., Raleigh, N. C., recently organized by officials of the Carolina Power & Light Co., as a subsidiary, has plans under way for the construction of a dam on the Pee Dee River, near Babin, N. C., and hydroelectric generating plant, with capacity of about 35,000 hp. A transmission system will be built to connect with the lines of the parent organization. The entire project is estimated to cost close to $2,000,000. Charles E. Johnson is president of both companies.

The Summerville Cotton Mills, Summerville, Ga., John D. Taylor, president, have preliminary plans under way for a hydroelectric generating plant on the Chattanooga River.

The City Council, Danville, Va., is planning for the construction of an electrically operated pumping plant, with capacity of 5,000,000 gal. in 12 hr. at the municipal waterworks.

A vocational department will be installed in the two-story and basement high school to be erected at Suffolk, Va., 60 x 150 ft., to cost $100,000. Charles M. Robinson, Times-Despatch Building, Richmond, Va., is architect.

Fire, March 8, destroyed the engine house, water tank tower and other mechanical departments at the plant of the Crozet Cider Co., Charlottesville, Va. The structures will be rebuilt.

The Macon Ice Co., Macon, Ga., has plans under way for a new one-story ice-manufacturing plant on Wall Street.

The Hanson Motor Car Co., Atlanta, Ga., manufacturer of automobiles, is planning for an addition to increase the output from 20 to about 50 complete cars per day. It recently acquired the plant of the American Motors Export Co., Jacksonville, Fla., as a branch. The two organizations will be merged under the Hanson company name.

Hackney Brothers, Wilson, N. C., operating an automobile works, are planning to rebuild the two-story structure destroyed by fire, Feb. 22, with loss estimated at about $110,000, including equipment and stock.

The Gulf States

BIRMINGHAM, March 13.

The Eureka Foundry Co., Gadsden, Ala., has plans under way for the construction of a new foundry to manufacture iron and other metal castings. Evan Owen is president.

Fire, March 3, destroyed a portion of the machine shop of the Hooten-Phillips Co., Sulphur Springs, Tex., with loss estimated at close to $25,000.

The Citizens Light & Power Co., New Orleans, recently organized with a capital of $2,000,000, is completing plans for a new electric power plant at Carrollton, La.

Fire, Feb. 28, destroyed a portion of the plant of the New Boston Cotton Oil Co., New Boston, Tex., with loss estimated at $100,000, including machinery.

S. F. Bowser & Co., Fort Wayne, Ind., manufacturers of gasoline pumps, tankage devices, etc., have leased a building at Dallas, Tex., for a Southern branch. It will concentrate on the production of gasoline filling equipment for garage service.

The Leeds Mfg. Co., Leeds, Ala., recently organized, has plans under way for the erection of a new ice-manufacturing plant. Frank R. Hurst heads the company.

The City Council, Dothan, Ala., is taking bids for electric power equipment for a new unit at the municipal lighting plant, comprising a 750-kw. generator set, with exciter, boilers, stokers and other equipment. R. W. Lisenby is city clerk; B. R. Pilcher is consulting engineer.

The Darco Co., Marshall, Tex., will build an electric power house at its new manufacturing plant, now in course of erection and estimated to cost in excess of $250,000.

A vocational department will be installed in the new high school to be erected at Greenville, Tex., bonds for which in an amount of about $100,000, have been voted.

The Worsham Brothers Co., Lamar Avenue, Houston, Tex., will soon commence the erection of a three-story automobile service and repair works, 65 x 113 ft., estimated to cost $110,000. A complete machine shop, paint shop and other departments will be installed. R. D. Steele, Houston, is architect.

The City Commission, St. Petersburg, Fla., is perfecting plans for a municipal electric power plant.

An electrically-operated pumping plant will be constructed by the Birmingham Waterworks Co., Birmingham, Ala., in connection with extensions and improvements in its system, estimated to cost about $500,000. The company has increased its capital to $3,029,700.

The Common Council, Brownwood, Tex., has perfected plans for the erection of a municipal electric light and power plant at the waterworks station, and work will commence at an early date.

Butler Brothers, Eastland, Tex., will soon commence the erection of a new gasoline producing plant and oil works, estimated to cost about $300,000, including machinery. It has acquired a portion of the Johnson tract, about 3 miles from the city for the works. The company will also establish a number of subsidiary plants in neighboring districts, with entire project estimated to cost $1,500,000, inclusive of machinery.

The Orange Ice, Light & Water Co., Orange, Tex., is planning for the erection of additions to its ice-manufacturing plants, estimated to cost about $50,000.

A vocational department will be installed in the new high school to be constructed at San Antonio, Tex., plans for which will be prepared by M. L. Waller, 511 Brady Building, San Antonio.

Fire, March 5, destroyed a portion of the plant of the Wichita Mill & Elevator Co., Wichita Falls, Tex., including steel elevator bins, conveying equipment, etc., with loss estimated at about $50,000.

A vocational department will be installed in the new high school to be erected at Gadsden, Ala., estimated to cost in excess of $150,000.

The Common Council, Elton, Tex., has plans under way for a municipal electric light and power plant.

The Common Council, Fernandina, Fla., has called a special election on April 4 to vote bonds for $150,000, for extensions and improvements in its electric power and ice-manufacturing plants.

The Central South

ST. LOUIS, March 13.

The Western Supply Co., 424 Boulder Street, Tulsa, Okla., will build a new one-story and basement forge shop, 50 x 60 ft., at 405-7 North Cheyenne Street.

The Jefferson City Light, Heat & Power Co., Jefferson City, Mo., has plans in progress for an addition to its electric power plant and for other improvements and extensions in the system, to cost about $85,000. H. S. Kilby is general superintendent.

The Common Council, St. Charles, Mo., has called a special election to vote bonds for $175,000 for the construction of a municipal electric light and power plant. Benham & Mullergren, 512 Gimbel Building, Kansas City, Mo., consulting engineers, will prepare plans.

Fire, March 6, destroyed a portion of the plant of the Brinly-Hardy Co., 334 East Main Street, Louisville, manufacturer of agricultural implements and equipment, with loss estimated at about $150,000, including machinery.

The Hackney Iron & Steel Co., Enid, Okla., recently organized, is arranging for the operation of a local plant to manufacture iron and steel products for oil well and other service. The initial works will be about 40 x 60 ft. D. R. Hackney is president and manager.

The Memphis Fender & Enamel Works, 52 South Fourth Street, Memphis, Tenn., recently organized, has leased a one-story building, 25 x 175 ft., for the establishment of a plant to manufacture automobile fenders and other sheet metal products, with repair department. F. H. May is president and general manager.

The Caruthersville & Kennett Light & Power Co., Kennett, Mo., is planning for extensions in its electric power plant and equipment, to cost about $100,000. A new transmission line will also be built.

The Miners Ice & Fuel Co., 318 Main Street, Joplin, Mo., is planning for a two-story ice-manufacturing plant at Kentucky Avenue and Tenth Street.

The Indiahoma Refining Co., Okmulgee, Okla., operating a local oil refinery, and similar plant at East St. Louis, Ill., has arranged for a note issue of $900,000, a portion of the proceeds to be used for extensions and improvements. Elmer E. Schock is president.

A vocational department will be installed in the three-story and basement high school, 125 x 207 ft., to be erected at Oklahoma City, Okla., estimated to cost about $250,000. Parker & Rittenberry, Oklahoma City, are architects.

The Nashville Pulp & Paper Corporation, Nashville, Tenn., is planning for the construction of a new power house. R. J. Cullen is president and general manager.

A vocational department will be installed in the three-story and basement high school to be erected at Liberal, Kan., estimated to cost $175,000. Lorentz, Schmidt & Co., 121 North Market Street, Wichita, Kan., architects, are preparing preliminary plans.

The Chase Mfg. Co., 3216 Morgan Street, St. Louis, manufacturer of steam vulcanizing equipment, has awarded a contract to August Stollman, St. Louis, for a new one-story factory, 50 x 100 ft. R. L. Chase is president.

A vocational department will be installed in the high school to be erected by the Board of Education, Owensboro, Ky., estimated to cost about $225,000. A. F. Hussander, 25 North Dearborn Street, Chicago, is architect.

The Standard Crate & Filler Co., Jefferson City, Mo., has awarded a contract to the Fruin-Colnon Construction Co., St. Louis, for a one-story addition, 100 x 200 ft., estimated to

cost about $55,000. A list of machinery for installation is being arranged. A. W. Happy is president.

The Choctaw Brick & Gas Co., Kennedy Building, Fort Smith, Ark., has acquired a building at Mansfield, Ark., and will establish a plant to manufacture brick, tile and kindred products. Allen Kennedy is secretary.

The Cumberland Power Co., Cumberland, Tenn., is planning for extensions and improvements in its power plant and system, estimated to cost about $150,000. A new transmission line will be constructed. G. S. Nunamaker, vice-president, is in charge.

The Common Council, Savannah, Tenn., is planning for a municipal hydroelectric power plant, and will commence the installation at an early date. A municipal ice-manufacturing plant will also be established. A. M. Patterson is chairman of the committee in charge.

A vocational department will be installed in the new high school to be erected at Hill City, Kan., estimated to cost about $135,000. William H. Sayler & Co., 306 Mutual Building, Kansas City, Mo., are architects.

Milwaukee

MILWAUKEE, March 13.

While the machine tool trade so far has experienced only a slight resumption of activity, confidence is expressed that the improvement in the general metal-working situation must carry the tool industry upward in due time. In the milling machine trade a feature of the past week has been a relatively brisk inquiry from automotive shops in Detroit, Cleveland and Indianapolis. Sales in this period were somewhat larger than before, but were confined to purchases of one or two tools. Large lots are still absent even in the inquiries being put out for miscellaneous requirements.

The Excel Mfg. Co., 3402 South Pierce Street, Milwaukee, manufacturer of interior woodwork, millwork, cabinets, billiard tables and store and office fixtures and furniture, will start work April 1 on the erection of a two-story brick addition, 40 x 120 ft., which will require some additional machinery, motors, etc. L. C. Neumann is secretary and treasurer.

The Six Wheel Truck Co., Fox Lake, Wis., which for several months has been negotiating with business men's associations for a permanent location, has decided to retain its establishment in Fox Lake and will begin work after April 15 on a one-story brick and concrete factory, 50 x 110 ft., estimated to cost $50,000 with equipment. For the past four years a small experimental shop has been maintained for the development of a heavy duty motor truck with dual sets of rear wheels, designed by F. N. Pettegrew, president of the concern.

John A. Luke, Burlington, Wis., will build a $45,000 public garage and service shop, 66 x 133 ft., part two stories and basement. The architect is Martin F. White, 908 Trust Building, Milwaukee.

The Board of Education, West Allis, Wis., will take bids until March 25 for an addition to the high school, to be equipped exclusively for vocational training purposes. The estimated cost is $120,000. The architects are Robert A. Messmer & Brother, 221 Grand Avenue, Milwaukee.

The Ever-Bit Auto Appliance Co., Milwaukee, has been incorporated with a capital stock of $15,000 to manufacture mechanical specialties and appliances. Arrangements are being made for a shop. The incorporators are C. M. Modney, Edward Guetzkow and A. C. Carlson, 1655 Tenth Street, Milwaukee.

The DePere, Wis., Board of Education has accepted the bid of the Hub City Construction Co., Stoughton, Wis., to build the new high and vocational training school at a price of $93,950. Contracts for heating, ventilating, etc., will bring the cost up to $165,000. Manual training equipment will be bought later. The architects are Foeller, Schober & Stephenson, Green Bay, Wis.

The Blum Brothers Box Co., Marshfield, Wis., has let the general contract for designing and erecting a brick and steel addition, 40 x 120 ft., and a wing, 56 x 80 ft., to the Krasin Construction Co., local. Inquiry is being made for woodworking, veneer cutting, nailing and motor equipment.

The Common Council, Kaukauna, Wis., has approved a bond issue of $175,000 for a new junior high and manual training institute. Parkinson & Dockendorff, architects, La Crosse, Wis., are revising original plans to come within the appropriation. Bids will be taken shortly after April 1.

The Northern Tool & Machinery Co., 736 Winnebago Street, Milwaukee, is increasing its force and expects later to add some new equipment and take more space to accommodate the growing demand for tools, dies, jigs, fixtures and welding work. It was established two years ago at 946 Bremen Street and moved to the present quarters last fall. John Umanski and Leonard Kaszolka are the owners.

The Fahrenkrug & Voissem Electric Co., Oshkosh, Wis., has been incorporated with $15,000 to manufacture and repair electrical equipment, etc. The principals are Alois Voissem, Menasha, Wis., and George H. Fahrenkrug, Oshkosh.

M. Tullgren & Sons, architect, 425 East Water Street, Milwaukee, are preparing plans for a $200,000 general storage and service garage, 102 x 150 ft., five stories and basement, to be erected by a local syndicate at Fifth and Wells streets. Work will start some time in April.

The Merrill, Wis., Board of Education will close bids April 4 for the construction of a vocational training annex to the present high school, and a new graded school building, the whole to cost about $200,000. Harry R. Allen is secretary of the board.

Detroit

DETROIT, March 13.

The Mason Motor Truck Co., organized last December, has secured the former plant of the Young Spring Co. in Flint, Mich., which will give 35,000 sq. ft. of floor space. Full production is planned by July 1. The company is headed by A. C. Mason, formerly with the Cadillac and Buick companies and later with the General Motors Corporation as consulting engineer.

The Benton Harbor Auto Machine Shop, Benton Harbor, Mich., will soon begin the manufacture of a line of automobile accessories, including an oil gage and a patent wheel rim remover.

The Corodium Sand Brick Co., Pontiac, Mich., will start work on a new plant as soon as weather permits.

The Pere Marquette Railway has entered into a contract with the Kellogg-Grego Co., Chicago, whereby the latter company took over operation of the shops at Ionia, Mich., on March 1.

The Stafford Roller Bearing Co., Lawton, Mich., will soon start construction work on a new factory, one story, 40 x 60 ft.

The Kirsch Mfg. Co., Kalamazoo, Mich., will build a new three-story factory, 130 x 200 ft., to cost about $100,000.

The Reiber-Kolz Co., Adrian, Mich., manufacturer of deflector spotlights and kindred equipment, has been reorganized, and has plans under consideration for improvements and extensive production. Walter G. White is president and general manager.

The Kirkland Brothers Machine Co., Detroit, recently organized with a capital of $250,000, is arranging for a local works to manufacture special machines for cylinder grinding work, and a line of small tools. Thomas H. Kirkland, 31 Elm Street, Springfield, Mass., heads the company.

The Saginaw Products Co., Saginaw, Mich., manufacturer of automobile equipment, will install new equipment in its machine shop. F. W. Mowbray is superintendent in charge.

Motors, transmission, and other equipment will be installed in the addition to be erected by the Kalamazoo Paper Box Co., Kalamazoo, Mich., estimated to cost about $175,000. Robert E. Staebler is secretary, treasurer and general manager.

A one-story power plant will be erected by the Cadillac Lumber & Chemical Co., Cadillac, Mich., at its new plant at Sault Ste. Marie, Mich., for which a site has recently been acquired.

The Pacific Coast

SAN FRANCISCO, March 7.

The California Car Co., Alexander Building, San Francisco, will soon commence the erection of a new plant at Martinez, Cal., for the manufacture of automobiles, estimated to cost in excess of $75,000. C. R. Manbert, 496 Twelfth Street, Oakland, Cal., is architect.

The Board of Trustees, University of California, Berkeley, Cal., will build a new power plant at the institution. William C. Hays, First National Bank Building, San Francisco, is architect.

The Los Angeles Gas & Electric Co., 645 South Hill Street, Los Angeles, has plans under way for a one-story compressor plant, 77 x 145 ft., estimated to cost about $60,000.

The Regan Forge & Engineering Co., Regan Street, Los Angeles Harbor, Los Angeles, has awarded a contract to the Austin Co., 702 Pacific Electric Building, for a new one-story machine shop, 80 x 200 ft.

The City Commission, Sacramento, Cal., is planning for the erection of a new hydroelectric power plant on the South Fork of the American River, in the vicinity of Sayles Flat. Albert Givan, city engineer, is in charge.

The Concrete Lumber Co., Los Angeles, recently organized with a capital of $1,000,000, has acquired about four acres on the San Fernando Boulevard for a new plant to manufacture concrete building products. The company is headed by George A. Mesick and Henry W. Schlueter.

A two-story cold storage and refrigerating plant addition will be erected by the Christopher Ice Cream Co., Los Angeles, estimated to cost about $30,000, exclusive of machinery. Richard D. King, Los Angeles, is architect.

The Kersey Pattern Works, 702 Date Street, Los Angeles, manufacturer of metal and wood patterns, and other foundry and machine shop equipment, is having plans prepared for a one-story factory, 50 x 120 ft., on Santa Fe Avenue. Herbert A. Hamm and Glen E. Smith, 412 Central Building, Pasadena, Cal., are associated architects.

A vocational building will be constructed at the group of high school buildings by the Santa Barbara High School District, Santa Barbara, Cal., estimated to cost about $500,000. W. H. Weeks, 369 Pine Street, San Francisco, is the architect.

The Santa Fe Railway Co., Kerckhoff Building, Los Angeles, has authorized an expenditure of $204,000 for extensions to its shops at San Bernardino, Cal., in addition to the new machine shop now in course of construction and which will cost about $300,000, with machinery. Plans for the other structures are being prepared, to include a power house.

The Union Oil Co. of California, Mills Building, San Francisco, is perfecting plans for the erection of its new oil distributing plant at Hoquiam, Wash. It is estimated to cost about $200,000, including machinery.

The Bourne Gold Mining Co., Bourne, Ore., has secured permission to use waters from Cracker and Little Cracker Creeks, and will erect a hydroelectric generating plant.

The Albina Electric Co., Mississippi Avenue and Shaver Street, Portland, Ore., manufacturer of electrical specialties, is planning for enlargements. W. D. Williams is head.

The Wonder Electric Mfg. Co., Chamber of Commerce Building, Portland, Ore., will operate a plant at York and Twenty-fourth streets for the manufacture of electrical products and appliances. Property has been acquired. John W. Henry is president.

Canada

TORONTO, March 13.

The demand for machine tools is showing steady improvement. Users who have been contemplating entering the market for some time are buying two or three machines and it is the general opinion that business is making good progress. The construction of industrial plants and additions is also more pronounced and dealers are looking forward to a larger buying movement in the early future. The automobile and car repair industries continue to furnish the greater part of the demand for equipment, although some dealers point out that wood-working concerns and the general industrial trades are buying more freely than in the past. Small tools continue to move freely with consumers buying for future use as well as for immediate requirements.

The Pease Foundry Co., 118 King Street East, Toronto, will rebuild its machine shop at Brampton, Ont., recently destroyed by fire, and is expected to enter the market in the early future for equipment.

The City Council, Edmonton, Alta., has authorized the expenditure of $115,000 for power plant extensions and improvements.

The mill owned by the Canadian Lumber & Timber Co., Vancouver, B. C., recently destroyed by fire with a loss of $110,000, will be rebuilt immediately.

The cartridge factory of the Dominion Arsenal, Quebec, Que., was damaged by fire about a week ago, and a second fire caused further damage to the main plant on March 10.

The machine shop of the Home Logging Co., Courtney, B. C., was destroyed by fire with a loss to building and equipment of approximately $75,000.

Birmingham Motors, Ltd., Peterborough, Ont., recently incorporated, has acquired the Canadian rights for the manufacture of the Birmingham car now being manufactured at Falconer, N. Y. The Hope plant at Peterborough, has been taken over by the company and manufacturing operations will be started in the early future. It is not the intention of the company to purchase any machinery or equipment at present.

The Canadian Aluminum & Brass Co., is opening a branch at Windsor, Ont., in a part of the plant occupied by the Dominion Motor Castings Co. It is affiliated with the General Aluminum & Brass Co., Detroit, and J. P. Carritte, president, states that manufacturing operations will commence about the end of March.

Rebuilding of furnaces and additions to the plant of Pilkington Brothers, Thorold, Ont., are responsible for a temporary shutdown of the plant, according to J. E. Harrison, general manager. Mr. Harrison further stated that he was looking forward to a revival of business in the building trades which would control to an extent the speed with which the alterations would be accomplished.

The Canadian Electric Castings, Ltd., is building a two-story foundry, 50 x 250 ft., on the former site of the foundry of the Canadian Electro Foundries at Orillia, Ont., destroyed by fire some time ago. It will specialize in steel castings, including grinding balls for the mining and concrete industries and is expected to be ready for operation by the middle of April. Equipment will include two electric, three phase Heroult furnaces having a daily capacity of 18 tons.

Electro-Castings, Ltd., Collingwood, Ont., which is erecting a foundry, expects to have it in operation before the end of April. W. T. Stephens, manager, is supervising the installation of a two-ton electric furnace of his own design with a capacity of 12 heats in 24 hr. Production in general and special lines will be in grey iron, hard iron and semi-steel.

Sharon Steel Hoop Co. Report

According to the annual report for 1921 of President Severn P. Ker, the Sharon Steel Hoop Co., Sharon, Pa., sustained a total loss last year of $2,711,674.86. The income account shows the following items:

Gross loss for operations after repairs of $600,367		$575,827.59
Idle plant expense		911,285.90
		$1,487,113.49
Miscellaneous income		114,234.25
Net loss		$1,372,879.24
Add:		
Depreciation	$376,969.23	
Interest	570,711.81	
Inventory write-off	391,114.58	
		$1,338,795.62
Total loss for 1921		$2,711,674.86
Deduct surplus 1-1, 1921		1,013,390.34
Deficit		$1,698,284.52

The company's gross assets are given as $25,314,502, including property account of $14,459,389.67. Its balance sheet shows current assets of $4,135,007, including $2,610,134 in inventories and $275,972.61 cash. Its current liabilities are $2,673,727.11, leaving a working capital of $1,561,280.39. Its statement carries an item of good will to the amount of $3,844,727.91.

Gross sales in 1921 were $5,274,942 on 93,383 tons of semi-finished and finished steel products.

During the year the company was obliged to sell $5,000,000 of a $10,000,000 bond issue. After this issue of 8 per cent first mortgage bonds, there is outstanding $13,317,300 of stock. The company has established a reserve of $4,152,510.69 and has set up a fund of $62,314 for contingencies.

Electric Steel & Forge Co. Plans

The Electric Steel & Forge Co., Cleveland, has announced new financing plans to meet present financial needs. It is proposed that the company be reorganized under a new name, probably the Mid-West Steel Co., with a capital stock of 7500 shares of 8 per cent preferred stock, par $100, and 39,000 of no par common stock. The new preferred stock will be entitled to dividends from Jan. 1, 1923, and will be redeemable at $110. It is estimated that $150,000 is needed at the present time and it is stated that the directors have already subscribed to $75,000 of the new preferred stock, or one-half of the amount required. The exchange of stock is to be made on the basis of one share of preferred for one share of new common and one share of old common for one-half share of new common. The company's obligations amount to $640,000 distributed as follows: merchandise creditors, $85,000; banks, $70,000; mortgages, $450,000; taxes, $35,000.

Subject to the successful consummation of this financing plan, creditors are asked to agree to a three-year extension upon payment of 10 per cent to merchandise creditors and 25 per cent to banks, while mortgage holders are asked to agree to an extension until December, 1923. The company states that many creditors and stockholders have already agreed to the plan.

Joseph S. Webster, New Haven, Conn., has organized a sales force to be known as Joseph S. Webster & Co., to represent the Kingsford Foundry & Machine Works, Oswego, N. Y., in the New England states for the Kingsford-Webster water tube boiler. Offices will be established in New Haven, Providence and Boston.

Current Metal Prices

On Small Lots, Delivered from Merchants' Stocks, New York City

The following quotations are made by New York City warehouses.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipment in carload lots from mills, these prices are given for their convenience.

On a number of articles the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general heading of "Iron and Steel Markets" and "Non-ferrous Metals."

Iron and Soft Steel Bars and Shapes

Bars:	Per Lb.
Refined bars, base price	2.53c.
Swedish bars, base price	10.00c.
Soft steel bars, base price	2.53c.
Hoops, base price	3.38c.
Bands, base price	3.13c.
Beams and channels, angles and tees 3 in. x ¼ in. and larger, base	2.63c.
Channels, angles and tees under 3 in. x ¼ in., base	2.53c.

Merchant Steel

	Per Lb.
Tire, 1½ x ½ in. and larger	2.50c.
(Smooth finish, 1 to 2½ x ¼ in. and larger)	2.70c.
Toe-calk, ½ x ⅜ in. and larger	3.20c.
Cold-rolled strip, soft and quarter hard	6.25c. to 7.25c.
Open-hearth spring steel	3.55c. to 6c.
Shafting and Screw Stock:	
Rounds	3.35c.
Squares, flats and hex	3.85c.
Standard cast steel, base price	12.00c.
Extra cast steel	17.00c.
Special cast steel	22.00c.

Tank Plates—Steel

¼ in. and heavier	2.63c.

Sheets

Blue Annealed

	Per Lb.
No. 10	3.28c. to 3.53c.
No. 12	3.33c. to 3.58c.
No. 14	3.38c. to 3.63c.
No. 16	3.48c. to 3.73c.

Box Annealed—Black

	Soft Steel C. R., One Pass Per Lb.	Blued Stove Pipe Sheet, Per Lb.
Nos. 18 to 20	3.55c. to 3.80c.	.....
Nos. 22 and 24	3.60c. to 3.85c.	4.10c.
No. 26	3.65c. to 3.90c.	4.15c.
No. 28	3.75c. to 4.00c.	4.25c.
No. 30	4.00c. to 4.25c.	.....

No. 28 and lighter, 36 in. wide, 10c. higher.

Galvanized

	Per Lb
No. 14	3.85c. to 4.10c.
No. 16	4.00c. to 4.25c.
Nos. 18 and 20	4.15c. to 4.40c.
Nos. 22 and 24	4.30c. to 4.55c.
No. 26	4.45c. to 4.70c.
No. 27	4.60c. to 4.85c.
No. 28	4.75c. to 5.00c.
No. 30	5.25c. to 5.50c.

No. 28 and lighter, 36 in. wide, 20c. higher.

Welded Pipe

Standard Steel	Black	Galv.	*Wrought Iron*	Black	Galv.
½ in. Butt...	—56	—40	¾ in. Butt...	—30	—13
¾ in. Butt...	—61	—47	1½ in. Butt..	—32	—15
1-3 in. Butt..	—63	—49	2 in. Lap.....	—27	—10
3½-6 in. Lap.	—60	—46	2½-6 in. Lap.	—30	—15
7-8 in. Lap...	—56	—34	7-12 in. Lap..	—23	— 7
9-12 in. Lap..	—55	—33			

Steel Wire

BASED PRICE* ON NO. 9 GAGE AND COARSER	Per Lb.
Bright basic	3.50c. to 3.75c.
Annealed soft	3.50c. to 3.75c.
Galvanized annealed	4 25c. to 4.50c.
Coppered basic	4.00c. to 4.25c.
Tinned soft Bessemer	5.50c. to 5.75c.

*Regular extras for lighter gage.

Brass Sheet, Rod, Tube and Wire

BASE PRICE

High brass sheet	16¾c. to 17 c.
High brass wire	17 c. to 17¼c.
Brass rod	14¼c. to 14½c.
Brass tube, brazed	26 c. to 27½c.
Brass tube, seamless	18½c. to 19 c.
Copper tube, seamless	20¾c.

Copper Sheets

Sheet copper, hot rolled, 24 oz., 19½c. to 20½c. per lb. base.

Cold rolled, 14 oz. and heavier, 2c. per lb. advance over hot rolled.

Tin Plates

Bright Tin		Coke—14-20	
			Primes Wasters
Grade "AAA" Charcoal 14x20	Grade "A" Charcoal 14x20	80 lb.	$6.05 $5.80
		90 lb.	6.15 5.90
		100 lb.	6.25 6.00
IC..	$10.00 $8.50	IC..	6.40 6.15
IX..	11.50 10.00	IX..	7.40 7.15
IXX..	13.00 11.25	IXX..	8.40 8.15
IXXX..	14.25 12.50	IXXX..	9.40 9.15
IXXXX..	16.00 14.00	IXXXX..	10.40 10.15

Terne Plates

8-lb. Coating 14 x 20

100 lb.	$7.00
IC	7.25
IX	7.50
Fire door stock	10.00

Tin

Straits, pig	32c.
Bar	37c. to 42c.

Copper

Lake ingot	15 c.
Electrolytic	14¾c.
Casting	14½c.

Spelter and Sheet Zinc

Western spelter	6½c. to 7c.
Sheet zinc, No. 9 base, casks	10½c. open 11c.

Lead and Solder*

American pig lead	5¾c. to 6¼c.
Bar lead	6¾c. to 7 c.
Solder, ½ and ½ guaranteed	23c.
No. 1 solder	21c.
Refined solder	17c.

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal

Best grade, per lb.	75c.
Commercial grade, per lb.	35c.
Grade D, per lb.	25c.

Antimony

Asiatic	5¾c. to 6c.

Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb.	25c. to 27c.

Old Metals

The market is stronger and shows a little activity. Dealers' buying prices are nominally as follows:

	Cents Per Lb.
Copper, heavy crucible	10.75
Copper, heavy wire	9.75
Copper, light and bottoms	8.00
Brass, heavy	5.00
Brass, light	4.50
Heavy machine composition	7.50
No. 1 yellow brass turnings	5.25
No. 1 red brass or composition turnings	6.75
Lead, heavy	3.75
Lead, tea	2.50
Zinc	2.50